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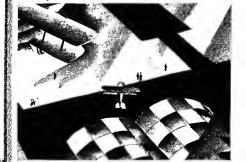

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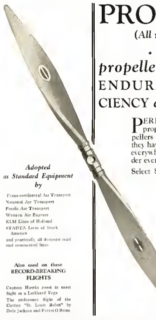

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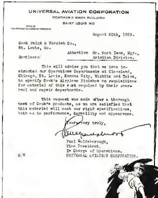

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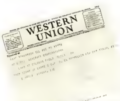

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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A McGRAW-HILL PUBLICATION · ESTABLISHED 1916

EDWARD P. WARNER, *Editor*

VOLUME · · · *August 31, 1929* · · · NUMBER

Air Force Pageantry

DURING the present week at Cleveland the industry is displaying its wares The atmosphere is and it should be primarily commercial but the military is not excluded The "Three Sea-Hawks" who shone at Los Angeles have been disbanded but their successors will be on hand to show that the Navy can fly as well from an inland field as over the sea and the Army's First Pursuit Group will evolute with an unvarying finesse.

Army and Navy pilots will be present They will operate as individuals as squadrons, and as groups or wings But they will have no chance to plan a military program As displays of aerial acrobatics, their contributions will be marvelous As displays of the actual use of air power, they will be negligible fragmentary

Of that, we have no criticism to offer The attempt to combine a military pageant with a commercial show and a group of civilian air derbies would be out of place The military element would weaken the appeal of the commercial features for which the race program primarily exists, and on account of which the industry supports them. Even at Los Angeles a year ago some of the civilian competitors protested that the Army and Navy had "stolen the show" Mr McReynolds, in his article in our last week's issue, pointed the lesson that the most brilliant of stunting exhibitions may thoroughly alienate the average spectator from any idea of flying on his own account If there is to be a truly military display it ought not to be an appendage to the National Air Races Whether the appendage modestly took a secondary place, or whether it became the tail that wagged the dog, its presence would be objectionable If there are to be real and complete military shows they ought to stand alone.

The Royal Air Force pageant, which has just been held for the tenth time near London, is an excellent, and in fact the one outstanding, example of what such shows may become Squadrons of pursuit, observation, and bombardment go through their exercises and combats in astonishingly accurate simulation of the outward semblance of real war Bombing attacks lay waste fortified ports built in papier-mache and plaster with the loving care that Hollywood devotes to the construction of a "set" Planes engage each other in battle, and spin down in alarmingly realistic flames Observations are made and the pilots' reports are conveyed directly to the crowd by radio and loud speaker The closest approach to the dashing realism of that display that has ever been offered to a great crowd in America was presented by the attack of a Navy light bombing squadron on a village erected in the middle of Mines Field at the National Races of 1928 Would it be worth while to emulate the British and run a separate display of Army and Navy air power under the conditions of field maneuvers? The suggestion that we should do so has often been made

THERE IS SOMETHING in favor of such a show but after careful reflection we are against it We do not believe that it could help commercial flying—and in the long run, nothing that gives a setback to commercial operation or the aircraft industry or to the private use of planes can be in the interest of Army or Navy air strength The distraction of the services from their present training schedules and maneuvers, now often carried on in Northern Michigan in mid-winter, on the plains of Texas, or far out at sea, in order to rehearse a program for an afternoon's entertainment, would be a serious sacrifice We can see no probability of substantial gain except a political one—and even that might prove a two-edged sword If Members of Parliament en bloc are anything like Members of Congress in the mass, a visit to the R A F Display is less likely to suggest to them the need for additional appropriations than to convince them that a force that can do such marvelous stunts must already be admirably equipped

No people can fully interpret the psychology of another Whether or not the R.A.F. show has been of real benefit, under the conditions existing in Great Britain, to the solid development of British aviation we do not know Frankly, we doubt it—notwithstanding

that several members of this editorial staff have had the great privilege of attending the Display and have come away with an enormous admiration for the R.A.F. and all its qualities. In any case, American conditions are different, and we sincerely trust that neither the sweet uses of advertisement nor any other consideration will lead American military authorities to attempt periodic public pageants on a grand scale here.

//

A Triumph of Faith

DETROIT has been witnessing events unique in aeronautical history. Pushed forward in the face of jeers, of distractions, of technical doubts and of financial struggles, the first all-metal airship has been completed. It has been filled with gas. It has flown. Leaving aside a few abortive experiments of the pre-Zeppelin era, it is the first of its kind. It makes its way from the hangar out into a world in which, only a few years ago, the very idea of a metallic balloon would have been the subject for ridicule as hearty as that with which a boat-builder of the seventeenth century would have greeted the notion of an iron ship.

Every innovation in the design of lighter-than-air craft has had behind it a group of men who figuratively walked up to the edge of a precipice and looked over, carrying their fates in their hands. Every one has a colossal gamble in it. There is no way of trying the thing out cheaply. Calculations can never be rigorously complete. The self-confidence that led Count Zeppelin, thirty years ago, to plunge on the construction of his first ship is fairly awe-inspiring. Only a little less enthusiasm and faith have been exacted of those who created the idea of the metal-clad ship and lived with it for seven years and built it and brought it finally to the stage of trial in flight.

In doing all that, they have afforded the chance for a picturesque demonstration by the industrial leaders of a great city of their faith in the future of aeronautics, that sort of faith which is the substance of things not known. Upon the board of directors of the company that built the metal airship there sit some twenty men. Perhaps not more than a sixth of them, and certainly not more than a third, would lay claim to any expert kowledge of airship design or operation. They are there because they believe in aircraft and they believe in progress, and they wanted to lend a hand and to feel that they had had some personal share in an experiment in which there was nothing obviously unworkable, and which recommended itself by its very boldness.

A single flight, or even a dozen, does not prove a vehicle of commerce or of war. There have been sceptics of eminent standing, and there still are. It was only by the most energetic and persistent campaign and against strong opposition, that a Navy contract for the present ship was secured. The all-metal construction is subject to certain obvious drawbacks and disadvantages, even as it has certain obvious merits. For ourselves, we reserve judgment on the ultimate possibilities of the type, but we are delighted that it has been given the opportunity of practical trial.

In the general enthusiasm over the success of a ship built in the name of a corporation, it should not be overlooked that the work was done by individuals, and that there were key men without whom it would have been difficult if not impossible to originate the project and carry it through. AVIATION's congratulations go with special warmth to Messrs. Upson and Fritsche and Hill and Schlosser and their co-workers, to Messrs. Emmons and Evans and the others who stood by with unvarying support when success seemed very far away.

//

The New Secretary

WHEN THE AIR COMMERCE ACT was approaching passage, three years ago last spring, there were innumerable prophets of gloom who predicted that the Department of Commerce was to become the graveyard of reputations. No one, they cheerily proclaimed, could meet the conflicting demands that the work of the Aeronautics Branch would impose. No one who was so foolish as to accept high place there, we were informed, would be able at once to administer his office honestly and in accord with the letter of the law and to preserve his own sanity and the respect of his neighbors.

But they were all wrong. The Cassandras and the Jeremiahs were wide of the mark. The test of time and experience has proven that their woeful and lachrymose anticipations were uncalled for. The Aeronautics Branch has sailed through its stormy seas and emerged on an even keel in almost untroubled waters. In 1926 there were many builders and operators of aircraft who were opposed to any Federal regulation. A year later there were still a few who thought that the aeronautical work of the Department of Commerce would be commendable in proportion as it was innocuously inactive. If any such remain in the industry, they are acting in the spirit of that ship where the captain informed the first mate that he wanted from him "nothing but silence, and damn little of that." There is, to be sure, no want of complaints against the details of Departmental action, but regulation is accepted as a fact, and it is recognized that it exists in the industry's own interest. To draw again upon a paraphrase of Voltaire's most-often-quoted saying, if there were no Department of Commerce we should find it necessary to create one.

We are slow in coming to the point, but finally we

arrive. What is it that has wrought this change in feeling, and this increase in the habit of looking to the Aeronautics Branch for assistance and advice, regarding it as a mentor rather than as a policeman? The natural pressure of events has had something to do with it, but it has been by no means an automatic process. It comes primarily as the consequence of a growing confidence in the Department's aeronautical personnel, and specifically in the men who have had charge of the work and shaped the policies. They have themselves to thank that suspicion has melted and that desperately difficult positions have grown gradually easier.

Secretary MacCracken having determined to retire, and remaining firm in spite of all persuasion, the President has turned to the man who has been MacCracken's right bower throughout these three years. Clarence M. Young is to become Assistant Secretary of Commerce for Aeronautics.

Clarence Young is so well known to the industry that it is hopeless to try to say anything new either of the record of his work or of his personal character. Of the two key positions in the aeronautical work done by the Department of Commerce, his has been probably the more difficult, or at least the more harassing. He has had most direct contact with the detailed technical problems of the industry, and his office has been the first point of attack when the industry's personnel protested the government's rulings on interpretations and applications of the regulations. He has had to say "no," and say it often and positively. That he has been able to do that and still retain the respect and personal friendship of those whose requests he denied is the best possible personal tribute.

We shall make no effort to gild the lily by stringing together fulsome terms of praise. We participate in a general confidence that the work of aeronautical promotion and regulation under the Federal government will remain on the highest plane, conducted on lines at once far-sighted and sober, progressive and careful. From the day when he takes office, Secretary Young will be able to count on the candid and whole hearted co-operation of every respectable aeronautical interest.

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A Well-Earned D.F.C.

THE Distinguished Flying Cross was created, at the recommendation of the Morrow Board, to rank as a decoration second only to the Congressional Medal of Honor in significance. Among the officers and men of the Air Corps and of naval aviation it has that standing. It is not, and it ought never to be, given for personal or political reasons. It ought never to be awarded in response to mere public acclaim. It is now given, both in the War and Navy Departments, only upon the recommendation of boards of officers acting with every shred of available evidence before them. The identity of the members of the boards and the details of their recommendations are not made public. They are subject to no pressure, and that is at it should be.

The War Department has just made a fresh group of awards. All are notable, but one in particular we single out as being a fitting recognition of work which had no spectacular elements and received little or no attention from the press. Lieutenant Harry A. Sutton's researches on spinning, carried out at the constant risk of his own life and after one of the Army's best test pilots had been killed in a flat spin on a machine of the same type that Lieutenant Sutton was studying, are worthy of terms of praise more eloquent than any that we can command. The officers of the Engineering Division of the Air Corps did not put the matter too strongly, in recommending Lieutenant Sutton for the award, in declaring his studies "the finest demonstration of brains, courage, and daring which had been brought to their attention in many years." The War Department gives proof of both willingness and ability to rate the purely technical achievements contributing to the development of aerial navigation as highly as the purely military contributions.

If the spinning experiments had been merely military in their significance we should not be mentioning them here. They are more than that. The experience that they represent ought to enter somewhere, directly or indirectly, into the design of every airplane. No designer could possibly read Lieutenant Sutton's report without learning something new about how to guard against undesirable spinning characteristics in his own product. Much can be done in the wind tunnel to forecast flying characteristics and improve them, but the solutions of all such problems as that of the flat spin depend finally, after theories have been developed and researches in the laboratory have been carried to the limit, upon trial in the air by a pilot. Test pilots, military and commercial, usually fail to receive the credit that is their due. The conferring of the D.F.C. upon Lieutenant Sutton adds fresh luster to an already brilliant roster.

THE Circulation Department desires to make the announcement that the classified and alphabetical index for Volume 26 of AVIATION *is now ready for distribution to all those who desire same. This index covers the issues of* AVIATION *from January to June (1929) inclusive.*

All requests for the index should be addressed to: Circulation Department, McGraw-Hill Publishing Company, Inc., Tenth Avenue at 36th Street, New York, N. Y.

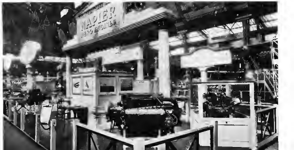
A STUDY OF THE *Engines* EXHIBITED AT THE *Olympia* *Aero Show*

By C. FAYETTE TAYLOR
*Professor of Aeronautical Power-Plant Design
Massachusetts Institute of Technology*

Bristol "Mercury" and "Jupiter" engines

A STUDY of the engines at the Olympia Show leads one to the general opinion that American practice has exerted a profound influence on foreign airplane engine designs. What we are pleased to call the "American" type of aircooled cylinder is now almost universally adopted the last to come into line being the well known Bristol firm, which up to that time had consistently used an all steel cylinder. One must admit, however, that the "American" aircooled cylinder with screwed-on aluminum head was originally a British development carried on by the Royal Aircraft Establishment during and after the War. That America adopted this construction almost universally is a tribute to the high quality of British research work, as well as to the efforts in America of S. D. Heron. That America has improved on this work in the last few years is not questioned, but we must acknowledge our indebtedness to Great Britain for the fundamental work on this type of cylinder construction.

More truly American is the inclosed valve gear for air-cooled engines, which has been adopted by all the important foreign manufacturers of radial engines, including notably Bristol and Armstrong-Siddeley, the two



The Napier booth. Left is a racing engine; in the center and to the case at the right are new "Lion" engines

The American visitor at a European air-craft show naturally examines the exhibits with special reference to their similarities to or divergencies from American practice. It is from that point of view that Professor Taylor, formerly in charge of the power-plant laboratory at McCook Field and subsequently with the Wright Company, has written of the engines at Olympia

leading British manufacturers of this type. The rocker-arm box design on two engines, the Farman 250 hp. nine-cylinder radial and the Fiat 100 hp. seven cylinder radial, is obviously taken directly from the latest type of American cylinder head.

Several versions of the N.A.C.A. cowling were in evidence at the show, ranging from the somewhat exaggerated form shown by Bristol, which inclosed the engine in a nose of such proportions that it might have been mistaken for a totally inclosed water-cooled engine, to the "Townend ring cowling" on some of the Armstrong-Siddeley engines, which is little more than a circular fillet over the top of the front row of cylinders.

In the water-cooled field many of the leading manufacturers have adopted the cast aluminum cylinder block construction first developed by Curtiss. This includes such concerns as Rolls-Royce and Lorraine Dietrich, who heretofore have adhered strictly to the welded steel construction.

A very general use of propeller reduction gears was in evidence on both aircooled and water-cooled engines, and in this respect one is inclined to believe that the foreign practice is ahead of the American. Many engines also carried superchargers, mostly of the centrifugal type driven through gears and a clutch. Other characteristic features not generally seen heretofore were forged aluminum pistons and ignition systems shielded against radio interference.

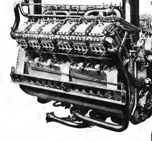
The "in-line" air-cooled engine has evidently come to stay, there being several examples of this type in the English exhibits and at least one each in the French, Italian and German sections. Duralumin crankcases were used on several water-cooled engines of Continental origin. In that respect European practice is distinctly ahead of the American. Many of the engines at the Show are already well known to the American aeronautic public and require no comment beyond the mention of their names. However many new models and much improvement on existing models were in evidence. A tabulation of the more important engines at the Show, giving their principal characteristics, is published with this article.

Perhaps the most interesting exhibit at the Show, at least from the point of view of new development was that of Bristol Aircraft Co., Ltd., which had a very impressive display near the main entrance of the hall.

The "Bristol Mercury" engine, competitor in the last Schneider Trophy Contest, was publicly shown for the first time and attracted an enormous amount of interest. While it still has the ear-marks of its descent from the "Jupiter" engine, almost all of the details have been changed, and one would say greatly improved. The most important change is the cylinder-head, which is a four-valve roof-head affair machined complete with cooling fins from a single duralumin forging. The head is screwed on to the steel barrel against a solid copper gasket, and carries a very cleverly designed valve-gear inclosed in a neat sheetmetal case and operated by parallel push rods, compensated for expansion.

The process of machining this cylinder head from a heavy block of duralumin was observed by the writer last year during a visit to the Bristol shops. That a four-

valve fully finned head, with valves set at an angle, could be so designed as to be practicable for machining from the solid, is certainly a credit to the engineers who conceived it. One can hardly imagine, on the other hand, such an expensive process being carried out in the United States, and we are inclined to believe that the American



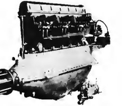
method of developing a fine foundry technique for casting such cylinder heads is, on the whole, a wiser policy.

The Mercury engine has a slightly shorter stroke than the Jupiter and carries a 0.66 Farman reduction gear and a built-in centrifugal supercharger. The mounting flange, large enough to inclose all the auxiliaries, is made up of steel stampings, and the mounting bolts are carried in flexible rubber joints to absorb vibration. The carbureter is fitted with a barometric throttle stop to prevent over-supercharging at sea level. Another example of this engine was shown inclosed in an N.A.C.A. cowling of rather extreme form, which has already been mentioned.

The older Bristol engines, namely the "Titan," "Neptune," and "Jupiter," which have been well known for some years, were also on display, but presented a new and attractive appearance with their aluminum cylinder heads with inclosed valve gear, similar to the cylinder heads used on the Mercury.

Another new model of considerable interest appearing at the Show was the Rolls Royce Type HX 825 hp. 12-cylinder "Vee" engine, displayed for the first time. It follows quite closely in its general design the Type F engines, also on display, which have been on the market for some little time. Both models have aluminum cylinder blocks with steel liners, reminiscent of Curtiss practice. Several of the engines shown were fitted with

Left: Sunbeam Coatalen "Sikh," Series III designed for lighter-than-air craft. Below: six-cylinder Hispano-Suiza, with new type aluminum combustion chambers

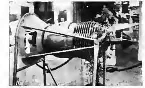


geared superchargers at the rear of the crankcase, with carbureter on the suction side. The new HX engine was so equipped. Incidentally it is rumored that the HX engine is to compete in the Schneider Cup Race, for which it will be "boosted" to develop some 1,600 hp.

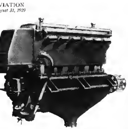
A. D. C. Ltd., displayed two very interesting new models—the "Hermes" 100 hp. aircooled four-in-line, and the "Airsix" 300 hp. six-cylinder in-line engine consisting of aircooled cylinders and the "Nimbus" crankcase. This engine has a very interesting form of nacelle cowling, shown in Fig. 1, by means of which it is claimed that perfect cooling is obtained. This company also displayed the very well known Nimbus watercooled engine, a development from the old "Puma."

Two new models were displayed by the Armstrong-Siddeley Company, the "Major Genet," a large edition of the familiar Genet, with minor improvements such as inclosed valve gear, and the enormous 14-cylinder "Leopard" engine, announced some time ago, but shown in public for the first time at the Show. It is essentially a large edition of the "Jaguar," the details following very closely those of the smaller engines. The large diameter of this engine causes one to wonder if a "Vee" or "X" arrangement of cylinders would not be preferable for engines of such large displacement.

Other well known Armstrong-Siddeley models were present. Shiny new valve gear covers mark the latest models. The method of supporting the rocker arms has been improved on all models, and now gives a compensating action which maintains tappet clearance nearly



Stolux rotary sleeve-valve barrel-type engine

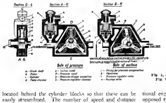


Sunbeam-Coatalen six-cylinder 100 hp. Diesel aero engine

constant with varying cylinder temperature. The fact that there were as many Armstrong-Siddeleys at the Hendon display as all other makes put together bears witness to the excellence of these engines and to the high esteem in which they are held by the Royal Air Force.

Attracting at all times a great deal of attention was the Napier racing engine developed from the "Lion" displayed in the Supermarine Racer. This engine is advertised to develop 900 hp. at 3,300 r.p.m. with a weight of 850 lb. and one was privately informed that it can do considerably better than this when the occasion demands. It carries a very interesting propeller reduction having double spur gears and countershaft arranged like the back gears on a lathe. The gear is, of course, fully inclosed and assists in the almost perfect streamlining to which this engine lends itself in the Supermarine racing plane.

The Standard Napier Lion engine was also shown in an improved model, with carbureter at the rear and



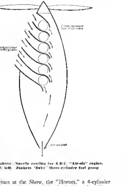


Fig. 1, above: Nacelle cowling for A.D.C. "Air-six" engine. Fig. 2, left: Junkers "Deku" three-cylinder fuel pump

located behind the cylinder blocks so that these can be easily streamlined. The number of speed and distance records held by the Napier Lion hardly needs mentioning. Major Segrave's car, which holds the world's land speed record, and also his motor boat which recently won the world's motor boat speed championship, were equipped with the racing model.

The Sunbeam company showed the largest engine at the Show—a new "Sikh" (series III) 1,000 hp. 12-cylinder engine for airship use. The size of this engine can only be appreciated by actually seeing it. It is watercooled with steel cylinder construction and semi-inclosed valve gear. Its weight is 2,760 lb. with propeller reduction gears, and it was developed from the type used on the successful trans-Atlantic flight of the airship R-34.

The only Diesel engine shown was the Sunbeam Type P.I., a 6-cylinder in-line engine of 100 hp. at 1,500 r.p.m. This is a watercooled engine apparently having steel cylinders with en-bloc aluminum water jacket construction. A totally inclosed fuel pump is mounted at the rear of the cylinder block. Very little could be learned about this design, and one wonders how far its development has progressed.

The De Havilland concern showed its well known "Gipsy" 4-cylinder in-line engine, which is being manufactured in the United States by the Wright Aeronautical Corporation. The rating of this engine has recently been increased to 90-100 hp. without increase in displacement.

The Parnell company showed one of their "Pobjoy" aircraft engines, a tiny 7-cylinder radial of 60 hp., weighing 120 lb. including propeller reduction gear. This engine has been type tested by the British Air Ministry, and should form a very interesting power plant for light airplanes.

A. B. C. Motors, Ltd. displayed one of the unconventional engines at the Show, the "Hornet," a 4-cylinder opposed type, to be mounted in the horizontal position. It is rated at 75 hp., at 1,875 r.p.m. and weighs complete 225 lb. A 2-cylinder horizontal opposed model called the "Scorpion," using cylinders and other parts interchangeable with the Hornet, was also shown.

Two small barrel type engines were exhibited, both of the single-ended type, aircooled. The 90 hp. "Redrup

Axial" has seven stationary cylinders of cast aluminum, while the Statax, of Swiss origin, is a rotary sleeve-valve engine of 42 hp at 1,900 r p m This engine also has seven cylinders, but in this case they are cast in one piece and the sleeves form the cylinder barrels Both engines are said to have been flight tested but one is inclined to doubt whether either of them has actually reached a stage of development where it would be entirely satisfactory for general use in aircraft

Both engines employ a "wobble-plate" to which the pistons are connected by connecting rods In both cases a separate mechanism is provided to resist the torque of the wobble plate The Redrup engine is made by the Redrup Lever Engine Syndicate of London and the other by Statax Motor S A Zürich

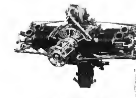
French Engines

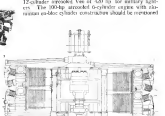
A number of interesting French engines were exhibited, many of which are already well known and require no detailed description. Among the French representatives were Farman, who exhibited their 600-hp 18-cylinder high-speed watercooled engine, which has already been described in the technical press and a 250-hp 9-cylinder geared aircooled radial engine having cylinders with integral rocker-arm boxes quite reminiscent of American practice An interesting feature of this engine, aside from the 2 : 1 reduction gear was the fact that it was equipped with battery ignition The Farman gear is now being built on license in a number of countries outside of France, the American license being held by the Wright company

The Societe Hispana Suiza exhibited its well known line of watercooled engines, which presented their usual clean and competent appearance.

In addition to their familiar line of steel cylinder watercooled engines, Lorraine-Dietrich showed a new 12-cylinder engine of very fine appearance having three aluminum cylinder blocks and rated at 600/700 hp This engine passed the French Air Ministry type test in June, and its up-to-date appearance leads one to predict that it will be widely used in French military and commercial service. The company's line of aircooled engines, quite similar to those of Armstrong-Siddeley, was also on display

The Société des Usines Renault showed a 4-cylinder vertical aircooled engine of conventional appearance and of 80 hp These and several similar engines at the Show have evidently been inspired by the success of the British 4-cylinder in-line engines The Societe des Moteurs Salmson displayed a few examples of its line of medium-powered aircooled radial engines





Above: A B C four-cylinder horizontally opposed aircooled 'Hornet' engine Right Top plan view of the Hornet engine This is a 75-82 hp adaptation of the A B C two-cylinder "Scorpion" engine and many parts are interchangeable The width of the engine in this position is 30 in

Italian Engines

Of the Italian exhibits the most prominent was that of Fiat Ltd which showed its 620-hp watercooled 12-cylinder engine, and its 1,000-hp watercooled engine of similar design These have steel-water-jacketed cylinders, with inclosed aluminum valve housings In addition to the watercooled engine there was exhibited a 7-cylinder aircooled radial rated at 85 hp which had aluminum cylinder heads with integral rocker-arm boxes, characteristic of present American practice.

The Isotta Fraschini Company displayed the same line of engines exhibited at the New York show in February, including its 1,000-hp watercooled twelve and the 12-cylinder aircooled Vee of 420 hp for military fighters The 100-hp aircooled 6-cylinder engine with aluminum en-bloc cylinder construction should be mentioned among the unconventional engines at the Show although it was exhibited in New York

Another unconventional Italian engine which attracted considerable interest was the 7-cylinder 90-hp Fuscaldo an aircooled radial designated as a "high altitude engine" Since it apparently had no supercharger the high altitude feature appears to refer to the fact that the engine has a variable-pitch propeller which seems to form an integral part of the assembly One gathered that the pitch of the propeller could be varied by hand at the will of the pilot, and no mechanism for preventing the abuse of this privilege with consequent overspeeding of the engine could be discovered at least without a better knowledge of Italian than that possessed by the writer The spinner and crankcase of the engine formed a streamlined nose for an airplane, with all accessories mounted inside the streamlining at the rear The cylinder construction was especially interesting since the cylinders were made from steel forgings with integral heads machined all over, with fore-and-aft valve seats set at nearly 45 deg from the cylinder axis The valve ports were separate finned aluminum castings screwed to the cylinder The streamlined crankcase incorporated in this design has seemed an attractive possibility to the writer for a long time It will be very interesting to follow the progress of so really unconventional a radial engine The "Colombo," a 4-cylinder vertical aircooled engine of 85 hp, quite similar to the Cirrus and Gipsy was also shown in the Italian exhibit

Other Foreign Exhibits

Germany was represented by a number of engine manufacturers The Argus Motoren Gesellschaft exhibited a 90-hp inverted 4-cylinder engine of clean design This engine mounts its two magnetos in front on top of the nose-piece and carries its lubricating oil in a tank integral with the top cover of the crankcase It is the first "wet sump" inverted engine the writer has seen

Mercedes Benz, Ltd, exhibited its little 2-cylinder opposed engine, which has become well known on account of its use in the Klemm Daimler light airplane, and a model of its new 12-cylinder watercooled engine of 800-1 000 hp fitted with centrifugal geared supercharger, built integral with the crankcase at the rear This engine has roller bearings for crankshaft and connecting rods one magneto and one battery ignition system, and an "Electron" (magnesium) crankcase It is very interesting on account of the fact that it represents the re-entry into the large aircraft engine field of two of the oldest and best known aircraft engine manufacturers in the world previous to the War

J Walter & Company, of Prague, exhibited its well known line of small radial engines in improved form and in addition four new models Three of the new models known as the "Vega," "Venus," and "Mars," are of 5, 7 and 9 cylinders respectively, and rated at 85 110 and 145 hp They are all clean designs with accessories at the rear The cylinders are of steel with aluminum heads screwed down when cold and held in place by split strap bolted on It is claimed that the heads are easily removable without removing the cylinder barrel The valve gear, with its inclosed rocker arms is reminiscent of American practice, but the cylinder is distinctly un-American by virtue of the very small angle between the valves In this respect it reminds one of the Wright radial engines previous to the J-5

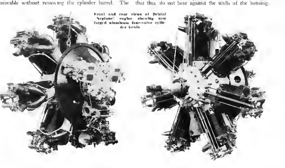
The fourth new engine shown by Walter & Company, the "Castor" is a larger version of the trio previously mentioned The cylinders are considerably larger than those of the other models, as the engine is rated at 240 hp with seven cylinders The magnetos are mounted "crosswise" just behind the propeller This latter feature makes it less attractive in appearance than the other models. It appears quite conventional except for the cylinder construction, which is similar to that of the smaller engines

Accessories

A number of interesting engine accessories were exhibited. The Société Rateau showed two centrifugal superchargers, one for exhaust-turbine drive and the other for gear drive with centrifugal clutch The Junkers Motorenbau showed its interesting three-cylinder "Deka" fuel pump, a cross section of which is shown in Fig 2 A very small and simple starter employing a blank-powder cartridge was shown on one of the Farman airplanes with a Gnome et Rhone "Titan" engine and in the Italian exhibit was an air starter quite similar to the Bristol starter which uses a tiny two-cycle engine to drive the air compressor

The Vickers oil cooler resembling a Lamblin radiator appeared to be well worked out and there were the usual number of exhibitors showing spark plugs, carburetors and so forth

Two other accessories well worth mentioning were the Carter centrifugal oil separator, operated by the flow of oil to the tank and designed to be installed in an airplane as a permanent part of the lubrication system [The Carter oil separator is intended to improve the oil cooling —Ed] and the Power Plus supercharger which is an eccentric vane type with the vanes so arranged that they do not bear against the walls of the housing



Front and rear views of Bristol "Neptune" engine showing new forged aluminum four-valve cylinder heads

SPECIFICATIONS OF SELECTED *Airplanes* AND *Engines* DISPLAYED AT THE *Olympia Show*

General Specifications					Dimensions				Weights, Lbs				Wing Loading Lbs./Sq Ft	Power Loading Lbs./H P	Max Speed M P H	Min Speed M P H	Cruising Speed M P H	Climb	Service Ceiling
Maker—Type Name or No	Purpose	Type	Construction	Engines	Span	Length	Height	Wing Area Sq Ft	Empty	Fuel and Oil	Disposable	Total							
Armstrong-Whitworth—A W 14 Biplane	Single Seat Fighter	Single Engine Biplane	H T Steel	Jaguar (geared and supercharged)	31' 4" 13' 4"	25' 2"	10' 6"	246	2400	403	900	3205	13 4	7 1	188 at 10000'			20000' 13½M	31000'
Blackburn—Nile	Monoplane Seaplane (14 passengers)	Three Engine Monoplane Flying Boat	Dural	5 Jupiter IX, 480 H P	90' 0"	65' 7"	19' 2½"	1900	14750	5950		20700	15 8	14 1	123	60	100	700' Min	14000'
—Ripon Mk II	Two Seat Torpedo Biplane	Single Engine Biplane Folding Wings	H T Steel	Napier Lion XI 530 H P	45' 6½"	36' 9"	13' 4½"	720	4132			7382	10 25	13 9	132 5	59	115	880' Min	13000'
Boulton & Paul—Sidestrand Mk III	3 Seat Medium Range Day Bomber	Twin Engine Bomber	H T Steel and Dural	2 Jupiter Series VIII 460 H P Each	72' 0"	41' 0"	14' 10"	980	8010	1960	2180	10200	10 45	10 6	140 at 10000'	54		15000' 19 M	24000'
Phoenix	2 Seat Light Monoplane	Strut Braced Monoplane	Timber	40 30 P A B C Scorpion	30' 0"	22' 0"	6' 5"	135				850	6 3	21 25	85/87	38		610' Min	9000'
Bristol—Bulldog	Single Seat Fighter Biplane	Single Engine Biplane	H T Steel	Jupiter Series VII (Supercharged)	33' 10" 27' 6"	24' 9¼"	9' 7"	307	1990	607	553	3150	10 4	6 95	174 at 15000'			25000' 20 5 Min	30000'
Gloster—Gannet	Single Seat Light Biplane	Single Engine Biplane	Timber	Blackburn Vee Twin 15 H P	18' 0"	16' 6"	6' 0"	105				460	4 5	30 6	72	35	86		
De Havilland—Gipsy Moth	Two-Seat Light Biplane	Single Engine Biplane	Steel Fuselage Wood Wings	Gipsy 100 H P	30' 0"	23' 11"	8' 9½"	260 app	962	159	429 629	1550a 1750g	6 0 app	16 5	102	44	85/90	500' Min	13000'
Hawk Moth	Four-Seat Passenger Monoplane	Strut Braced Cabin Monoplane Folding Wings	Steel Fuselage Spruce Wings	Geared Lynx 240 H P	47' 0"	29' 1"	9' 6"	304	2210	588	705	3900	11 5	14 5	124	53		770' Min	14500'
A V Roe—Avian	Two-Seat Light Biplane	Single Engine Folding Wing Biplane	Welded Tube Fuselage Wood Wings	Cirrus Mk II 85 H P or Genet 85 H P	28' 0"	24' 0"	8' 6"		935	170	345	1450		14 5	100	80	82	750' Min	16000'
Avro Five	Five-Seat Passenger Plane	Three Engine Cantilever Monoplane	Welded Tube Fuselage Spruce and 3-Ply Wing	3 Genet Major 105 H P Each	47' 0"	35' 9"	9' 6"	333	2799	515	1115	4420	13 2	14 0	121		105	750' Min	13000'
Short—Mussel	Two-Seat Light Seaplane Monoplane	Strut Braced Monoplane Low Wing Twin Floats	Dural	Cirrus Mk III 95 H P	37' 3¼"	25' 0"	11' 9"	214	1061			1900	7 67	17 25	102	48		630' Min	
Singapore	Five-Seat Reconnaissance Biplane Flying Boat	Twin Engine Biplane	Dural	2 Rolls Royce H 10 Each 800 H P	93' 0"	65' 6"	21' 0"	1727	12955	4930	2115	20000	11 6	11 75	120			890' Min	15500'
Desoutter	Three-Seat Cabin Monoplane	Cantilever Monoplane	Timber	Cirrus Mk III 95 H P	35' 6"	27' 0"	7' 0"	190	980			1730	9 05	17 5	102	42	86	600' Min.	14000'
Westland—Westland IV	Six-Seat Passenger Monoplane	Three Engine Braced Monoplane	Mixed Timber and Metal	3 Hermes, 105 H P each	57' 6"	37' 6"	9' 6"	490	3150	500 app	1550 app	5900	11 2	11 45	120		100	640' Min	12000'
Wapiti Mk IV	Military General Purpose Two-Seater	Single Engine Biplane	H T Steel and Dural	Jaguar 480 H P	46' 5"	32' 6"	11' 10"	488											
Widgeon Mk III A	Two-Seat Light Monoplane	Strut Braced Monoplane	Mixed Timber and Metal	Cirrus Mk III 95 H P	36' 4½"	23' 5¼"	8' 0"	200	935	170	545	1650	8 25	18 7	106		86	640' Min	15000'

Note.—Where two figures are given for span the upper relates to the Upper Wing. Disposable Load includes Crew and Special Equipment IF ANY but not Fuel and Oil

Maker—Name or No	Type	Cooling	Construction	No. of cylinders	Bore	Stroke	Compr Ratio	Normal B H P	Normal R P M	Maximum B H P	Maximum R P M	Gear Ratio	Weight Dry Lb	Wt /Hp Lbs	Consumption Fuel Lb /Hp /Hr	Consumption Oil Lb /Hp /Hr	
A D C Aircraft Ltd—Nimbus Airsix	Six cylinder vertical Six cylinder vertical	Water Air	Aluminum blocks (6 cylinders each), steel barrels, overhead camshaft. 3 valves per cylinder	6	6"	7 5"	5 4	305	1450	332	1600	1	670	2 19	0 46	0 021	
Armstrong Siddeley Motors Ltd—Genet	Single-row radial	Air	Steel cylinder barrels with screwed-on aluminum head 'Y' alloy pistons One piece counter balanced crankshafts Valves push rod operated through epicyclic gears at front Enclosed valve gear Split aluminum (cast) crankcase Centrifugal fan fitted in induction system in all types Dual magneto ignition and dry sump lubrication Pressed steel mounting cones on all types Epicyclic reduction gears on geared types Gear driven centrifugal superchargers on supercharged engines	5	4"	4"	5 25	82	2200	88	2420	1	230	2 38			O A Dia 34"
Genet Major Mongoose	Single-row radial Single-row radial	Air Air		5 5	4 25" 5"	4 5" 5 5"	5 2 5 0	110 155	2200 1930	128 165	2420 2035	1 1	250 290	2 38 2 35			Direct drive / Gear drive O A Dia 38" O A Dia 45 5"
Lynx	Single-row radial	Air		7	5"	5 5"	5 0	216 225	1460 2000	230 235	2090 2000	1 0 657	365 505	2 21 2 19			Direct drive / Gear drive O A Dia 45 5
Lynx Jaguar Jaguar	Single-row radial Two-row radial Two-row radial	Air Air Air		7 14 14	5" 5" 5"	5 5" 5 5" 5 5"	5 0 5 0 5 0	220 at 14500' 410 400	2000 1700 2000	 460 510	 1870 2200	 1 0 657	590 550 865 890	2 51 2 39 1 84 1 75			Supercharged to 14,500' O A Dia 45 5 Direct drive O A Dia 45 5 Gear drive O A Dia 45 5
Jaguar	Two-row radial	Air		14	5"	5 5"	5 0	470 at 10000'	1870				850	2 07			Supercharged to 10,000' O A Dia 45 5
Jaguar	Two-row radial	Air		14	5"	5 5	5 0	398 at 14500'	2200			0 657	950	2 02			Gear drive supercharged to 14 500' O A Dia 45 5
Leopard	Two-row radial	Air		14	6"	7 5"	5 0	748 815	1500 1700	805 900	1650 1870	1 0 633	1463 1650	1 82 1 90			Direct drive / Gear drive O A Dia 54 8"
Bristol Aeroplane Co., Ltd —Titan series II	Single-row radial	Air	Open ended steel cylinder barrels, screwed on heads machined from 'Y' alloy forgings. Two piece crankshafts, with unsplit big end having floating bushes 4 valves per cylinder Push rods operated through epicyclic gears. The Jupiter engines have forged dural crankcase Pressed steel cone mountings on all types Dual magneto ignition and dry sump lubrication Concentric bevel reduction gears on geared engines Provision for gas starter and for inertia starter and for gun synchronising gears Petrol pump may be fitted	5	5 75"	6 5"	5 0	205	1700	220	1870	1	500	2 27			
Neptune series I	Single-row radial	Air		7	5 75"	6 5"	5 0	290	1700	315	1870	1	610	2 1			
Jupiter series VI F H	Single-row radial	Air		9	5 75"	7 5"	5 8	420	1700		1870	1					
Jupiter series VI F M	Single-row radial	Air		9	5 75"	7 5"	5 5	465	1700		1870	1					Full throttle not available below 4000'
Jupiter series VII F	Single-row radial	Air		9	5 75"	7 5"	5 5	500	1775		1950	1					Gear driven supercharger. 480 B H P - 1775 R P M at 9000'
Jupiter series VIII F	Single-row radial	Air		9	5 75"	7 5"	5 8	460	2000		2200	0 5					Full throttle not available below 4000' gear drive
Jupiter series IX F	Single-row radial	Air		9	5 75"	7 5"	5 5	515	2000		2200	0 5					Gear drive
Jupiter series XI F	Single-row radial	Air		9	5 75"	7 5"	5 0	490	2000		2200	0 5					Gear drive
Cirrus Aero-Engines, Ltd —Cirrus Mark III	Four cylinder vertical	Air	C I cylinders Removable aluminum heads, 2 valves per cylinder push rod operated Dural con rods. Wet sump lubrication Dual magneto ignition. Zenith carburetor	4	110m/m 4 34"	120m/m 4 72"	5 1 5 4	90 92 5	1900	98 97	2100	1	285	3 13 3 00	0 57	0 022	
Cirrus Hermes.	Four cylinder vertical	Air		4	114m/m 4 5"	140m/m 5 52"	5 1	105	1900	115	2100	1	310	2 95	0 55		
D Napier & Son Ltd —Lion series XI	Three row broad arrow	Water	Separate steel cylinders Aluminum head blocks Articulated con rods 4 valves per cylinder with separate overhead camshafts for inlet and exhaust valves Roller bearing crankshaft Dual magneto ignition	12	5 5"	5 125"	6 0	530	2350	575	2585	0 53	985	1 87	0 50	0 024	Plain spur reduction gear
Lion racing (VIID)	Three-row broad arrow	Water		12	5 5"	5 125"	10 0			875	3330	0 755	930	1 065	0 44		Schneider trophy 1927
Pobjoy	Single-row radial	Air	Steel cylinders, screwed on Dural heads, Dural pistons two-piece crankshaft Unsplit big end with floating bush Helical reduction gear	7	72m/m 2 83"	87m/m 3 42"	1 0	60	3000	67 5	3300	0 524	115	1 92	0 57	0 03	
Rolls Royce Ltd —F type.	Vee	Water	Aluminum blocks, steel liners. 4 valves per cylinder Separate camshaft for inlets exhaust Forged 'Y' alloy pistons Forged and plain con rods Spring drive to all auxiliaries Floating drive crankshaft to airscrew gear. Twin magneto ignition Supercharged engines have gear driven centrifugal blowers with a spring drive	12	5"	5 5"	6 0 7 0	470 480	2250	530	2500	0 632 0 521	865	1 76	0 45	0 013	Either compression available with either gear 7 0 compression gives normal Hp at 3000'
F type	Vee	Water		12	5"	5 5"		560 440	2250		2500	0 632 0 521			0 5		Supercharged to 5 000'—Only given rated Hp Supercharged to 11 500'—Either gear ratio avail
H 10	Vee	Water		12	6"	6 6"		825	2000		2200	0 477	1900	1 77	0 49	0 015	Moderate supercharger fitted Full boost available at ground for Take Off
DeHavilland Aircraft Co, Ltd —Gipsy	Four-cylinder vertical	Air	C I cylinders, detachable aluminum heads, push rod operated valves Dural con rods Wet sump lubrication Dual magneto ignition	4	114m/m 4½"	128m/m 5 0"	5 0	90	1900	100	2100	1	285		0 56	0 01	

THE 1929 National Air Races GET UNDER WAY

By Herbert F. Powell

While workmen were putting last minute appointments on a somewhat dampened airport Cleveland's National Air Races and Aeronautical Exposition were inaugurated on August 24.

Indicative of both the brilliancy of the forthcoming 10-day aerial program and the industrial magnitude of twentieth century transport—via the skies—a floral parade, of more than an hour's length, passed through the downtown streets, terminating at the exposition building.

The tone of this pageant typified the usual civic enterprises. Nevertheless it proved a whole-hearted gesture on the part of the people of Cleveland in welcoming the gathering airmen. The passage through which this pageant moved was highly and colorfully decorated, with an eye toward an aeronautical theme. A fleet of four Goodyear blimps, including the newly launched "Defender," soared slowly overhead in escort. Miniature pylons, one of which was utilized as a downtown ticket office, suggested the spirit of the racing classic.

Preceding formal opening of the air race program nineteen planes just completing a "Goodwill tour" of Ohio, roared over the city and landed at the airport. The exposition, held in Cleveland's $10,000,000 public auditorium, was officially opened at 1 p.m. by Luther K. Bell, secretary of the Aeronautical Chamber of Commerce of America. In a dedication ceremony in the exposition building at 7 30 p.m. Mayor John D. Marshall and City Manager William R. Hopkins, presented the "key to the city" to Clifford Henderson, managing director of the combined races and show.

Although heavy rains saturated Cleveland's airport on the day before the opening weather forecasts indicated fair skies would smile upon the airmen for the duration of the contests. In newly built roads leading to and from the airport, in the gala dress of the stands and official reviewing building, in the uniformed and especially trained attendants, and in the condition of the airport itself, the visiting pilots, participants and spectators saw fruition of Mr. Henderson's well laid plans which began last February.

The winner of the Women's Air Derby. Mrs. Louise McPhetridge Thaden lead her fellow pilots across the finish line in the first women's derby ever held in this country

Sunday saw the beginning of the racing program and an attendance of some 40 000 persons, which included governmental and civilian aeronautic officials. The first event on the card was Event No 8, a civilian 50-mile 10-lap race for planes powered with OX5 engines. Due to the fact that some of the eight contestants used the 10 mile pylons instead of the 5 mile pylons, the affair was called off and postponed to later in the week. Douglas Davis and Arthur Chester, both flying OX5 Travel Airs did some pretty flying on the pylons.

The second race, Event No. 23, a 120-mile 12-lap race for National Guard planes powered with Liberty engines saw three Curtiss Falcons walk away from nine Douglas O2Hs. The Pennsylvania Guard unit won the blue ribbon when Maj. John S. Owens flashed across the line with an average speed for the course of 149.91 m.p.h. to his credit. Lieut. Theodore E. Baker was second place with an average speed of 148.4 m.p.h., and Lieut. Phillip R. Love placed third with an average speed of 144.58.

Event No. 34, the next on the program, afforded the spectators the opportunity of viewing stunting "as she is done." It was the first of daily contests by three-plane teams. "Fred" Lund, "Ed" Hedeen, and R. W. Mackay, all of the Waco company, won Sunday's prize money with a clever bit of stunt flying in Whirlwind powered tapered wing Wacos. Every stunt imaginable was pulled by the trio.

Although two Bachs were ready for Event No. 20, a 75-mile 15-lap race for multi-engined planes, it was called off due to an insufficient number of entries, and Event No. 16 was moved up one on the program. This event was the first of a series of 'chute jumping contests, the entries striving to land as near as possible to a circle marked out in the center of the field. First place honors went to L. C. Snyder who landed 29 ft. from the center of the circle. Second place went to Edward Anderson with a distance of 156 ft. 3 in. John F. Ringer added an extra and unscheduled thrill to the event when he missed the field entirely and landed on the awning over the entrance to the grounds. In spite of his unusual descent, Ringer was not injured. A total of thirteen jumpers "stepped off."

The nine "High Hats" crack group of Navy pilots, shown roped together in a formation flight. Their home station is the U. S. S. Saratoga

A dead-stick landing contest was in order next, but there were only three entries. Therefore the entire "field" was "in the money," as it were. Orin Welch copped the biggest share by bringing his Swallow down to within 2 ft. 6 in. from the line. Ralph Wensinger in an Eaglerock came to a full stop at 9 ft. 7 in. from the line, and before the shouting was over Larry Rich had halted his American Eagle 18 ft. 3 in. from the line. When one compares the distance differences of the three competitors it is perhaps just as well that there were no other entries, else the last place winner might have "forced landed" in the lake.

Following the "dead" event it was announced that the Ohio Derby would take off. Six entrants took the air and eventually word was received that five of them had landed at Lima in the following order.

Vern Roberts Monocoupe with Velie engine; Lewis Love Davis monoplane with LeBlond engine; H. A. Speer Barling monoplane with Genet engine; Barney Zimmerley Barling monoplane with LeBlond engine; Leslie Miller Barling monoplane with LeBlond engine.

One of the striking floats in the Cleveland air race parade

The arrival of six Marine Falcons, seventeen Boeing Navy Fighters, eighteen Army Falcons, and the cream of the Air Corps (the Selfridge Field Corps) was the beginning of some formation stunt flying that brought back memories of the 1928 National Air Races.

As a means of proving that one can leave a cabin plane in a hurry when one desires to leave, Elinor Smith of endurance fame, took aloft a Bellanca CH with six jumpers aboard. The six jumpers stepped off in a hurry according to schedule and the demonstration was a success.

The novel event of the day was the arrival of Hugh Robbins in a Waco with Wallace Franklin in a soaring glider in tow. The pair had come all the way from Ypsilanti, Mich., and when at an altitude of 2,500 ft. over the field Franklin cut loose and glided down to a perfect landing directly in front of the stands. The landing was made in eight minutes from the "cut-loose" to the dead stop.

The feature event of the program on Monday, was the arrival of the Women's Air Derby fliers completing the last leg of their race from Santa Monica. Louise McPhetridge Thaden won, with a record of 20 hr. 19 min. 02 sec., followed by Gladys O'Donnell whose time was 21 hr. 21 min. 41 sec. Phoebe Omlie led the light plane class with a time of 25 hr. 12 min. 47 sec., with Thea Rasche second in 31 hr. 12 min. 30 sec.

Eighteen women started the race from Clover Field, Santa Monica at 2 p.m., Aug. 18. Fliers and their planes

in the CW class were: Phoebe Omlie, Monocoupe; Mrs. Keith Miller, Kinner Fleet; Claire Fahy, Travel Air; Thea Rasche, DH Moth; Bobbie Trout, Golden Eagle; Edith Foltz, Eaglerock. In the DW class were: Florence L. Barnes, Mary Von Mack, Blanch W. Noyes, Louise M. Thaden, Opal L. Kunz, and Marvel Crosson,

E. B. Blythe (left) and H. A. Bruno, who are handling publicity for the 1929 air races and exposition

all Travel Air; Amelia Earhart, Lockheed; Ruth Nichols, Rearwin Ken Royce; Neva Paris and Vera D. Walker, Curtiss Robin; Ruth Elder, Swallow; Gladys O'Donnell, Waco. Mae Haizlip started a day late.

When the contestants arrived at San Bernardino for the first night's stop, Phoebe Omlie led the CW class with an elapsed time of 32 min. 15 sec., and Bobbie Trout was second. Louise Thaden led the DW class with an elapsed time of 27 min. 30 sec., and Florence L. Barnes was second.

The stop for Aug. 19 was Phoenix, Ariz. Leaders were: CW class, Phoebe Omlie, 4 hr. 14 min. 15 sec.; DW class, Florence L. Barnes, 3 hr. 21 min. 10 sec. Edith Foltz and Gladys O'Donnell were second in the two classes. Claire Fahy was out of the race at this point.

Between San Bernardino and Phoenix Miss Marvel Crosson was killed when her plane spun into the ground. Three ranchers saw the plane go down behind the hills, and it was some time before searchers reached the scene of the crash. The cause of the spin is still unknown.

On Aug. 20 the fliers reached Douglas, Ariz., with Louise Thaden, 5 hr. 13 min., and Phoebe Omlie, 6 hr. 24 min. 27 sec., leading. At El Paso, Tex., on Aug. 21, the same two led with elapsed times of 6 hr. 48 min. 31 sec., and 8 hr. 35 min. 24 sec. Amelia Earhart was second in the DW class, and Edith Foltz second in the CW class.

At Fort Worth, Tex., Aug. 22, Louise Thaden, 11 hr. 4 min. 30 sec. and Phoebe Omlie 13 hr. 28 min. 50 sec. remained ahead, with Amelia Earhart and Mrs. Miller second in their respective classes. Florence L. Barnes was out of the race here. The leaders were the same at Wichita, Kansas, Aug. 23, with elapsed times of 13 hr. 25 min. 52 sec. and 16 hr. 30 min. 16 sec. Gladys O'Donnell and Edith Foltz were second. The relative positions remained unchanged at East St. Louis, with elapsed times of 16 hr. 27 min. 57 sec. and 20 hr. 23 min. 33 sec. in the two classes.

The last overnight stop before the arrival at Cleveland was made at Port Columbus, the municipal airport at Columbus, Ohio. Mrs. Thaden and Mrs. Omlie were still ahead with elapsed times of 19 hr. 35 min. 40 sec. and 24 hr. 14 min. 32 sec. Miss O'Donnell was still second in her class, but Thea Rasche had moved up to second place in the CW class, while Bobbie Trout was forced to drop out and the times of Mae Haizlip and Edith Foltz were not figured because of irregularities in their schedule.

The final standing of the contestants in the DW class as they arrived at Cleveland was: Louise McPhetridge Thaden, first; Gladys O'Donnell, second; Amelia Earhart, Blanch Noyes, Ruth Elder, Neva Paris, Mary Von Mack, Opal L. Kunz, Mae Haizlip, Vera D. Walker. In the CW class the order was: Phoebe Omlie, Thea Rasche, Mrs. K. Miller, Edith Foltz. All five of the leaders in the DW class had Whirlwind-powered planes, while Mrs. Omlie's plane had a Warner engine.

A bit before the arrival of the Women's derby Verne D. Christen took first honors in the daily dead stick landing event. Any better would not do in the case of Christen, as he landed right on the line.

The arrival of derbies being in order, the next event was the arrival of the All Ohio Derby. M. A. Speer in his Genet powered Barling monoplane took first place money with a total elapsed time of 4 hr. 22 min. 59 sec. Lewis Love finished second with a total elapsed time of 4 hr. 43 min. 15 sec., and Barney Zimmerley took third place money with a total elapsed time of 5 hr. 13 min. 1 sec.

The first closed course event was an affair that has been an important part of the Air Races since the early days . . . . the Liberty Engine Builders Trophy race. Maj. J. Sidney Owens Flying a Curtiss Falcon was first place winner with an average speed of 143.07 m.p.h. for the 120 mile 12 lap course. Second place went to Benjamin Nasief who flew his Curtiss Falcon over the course at an average speed of 133.89 m.p.h. Third place was captured by John Gill who maintained an average speed of 132.72 m.p.h. Seven pilots entered the military observation plane race and six of them were outclassed. The feature of the race was the clean turns made on the pylons by Major Owens. On one lap he hit it up to 157 m.p.h.

When the smoke had cleared away from the Liberty engine race the daily jumpers went aloft to step off and come down again. Joseph Crane landed 22 ft. from the center of the circle and walked away with first place honors. Edward Anderson landed 60 ft. 4 in. from the "spot" to win second place and L. C. Snyder came down 200 ft. from the spot. When one compares Monday's distances with Sunday's one gets the impression that the boys are getting farther and farther away from home.

Soon after the 'chutes had been folded up and the boys off the field, Lee Schoenhair set his snappy looking Wasp powered Lockheed Vega down on the field to take first honors in the non-stop derby from Los Angeles. Schoenhair's time for the 2,072-mile jaunt was 13 hr. 51 min. 10.8 sec., or an average speed of 149.65 m.p.h. Had he carried on to New York at that speed he would have hung up a new trans-continental record.

The attendance at Monday's meet was estimated at around 50,000 people. The rumor that Colonel and Mrs. Lindbergh would be present brought out the crowds in real style. The military planes did their usual setting up exercises and to add color to the programme, four Goodyear blimps maneuvered about the sky.

INSIDE THE Exposition Building AT CLEVELAND

By Leslie E. Neville

ALTHOUGH the airplane and engine exhibits were fewer in number than those of some of the previous expositions, the representation at the National Aeronautical Exposition on the opening day (Aug. 24) presented an excellent cross section of the industry. Of the 20,000 persons who witnessed the day's activities at the airport, it is reported by officials that at least one-half of that number attended the exhibit at the Cleveland Public Auditorium during the first day and evening.

In striking contrast to some of the previous expositions, ample space was provided for visitors to stand off and view airplanes from a distance. The idea of fencing or roping off exhibits seems to be growing in popu-

The interior of the Exposition building as it appeared at the opening

larity as several of the manufacturers employed this means of presenting an attractive exhibit. However this method has the disadvantage of preventing many interested persons from getting a close view of the product being shown.

EVERY EFFORT was made by the show management to provide comfort and additional entertainment for visitors, and loud speakers were installed in all parts of the hall for the purpose of broadcasting music and announcements. In addition to this, several musical features were presented on the stage of the arena and broadcast to the more remote portions of the exposition building. Decorations were simple but effective and consisted mainly of evergreens and other forms of greens with bunting in the national colors. In one portion of the exhibit a very appropriate form of decoration in the form of a number of colored silk wind cones, blown by electric fan drafts, was employed.

Of the 54 airplanes in place on the opening day only a few were new designs. Most of the others were developments of models previously exhibited or adaptations of existing designs to new power plants. In the latter case the tendency toward the provision of greater power to provide adequate reserve was almost always the case. Two of the newest designs had not yet been test flown but were rushed to completion for the Show and shipped by rail. These were the General Airplanes Company "Mailplane" and the Great Lakes Aircraft Corporation's twin-engined amphibion.

The Mailplane, which embodies a number of original features, is an open cockpit sesquiplane powered with a Series C Pratt & Whitney Geared Hornet engine and having an all duralumin monocoque fuselage. This plane has a normal gross weight of 6,250 lb. and a pay load

The Curtiss "Thrush," an interesting part of the exhibit of Curtiss Flying Service

of 2,000 lb. The Great Lakes amphibion is a biplane type powered with two American Cirrus engines, having a hull constructed largely of metal.

Among the other new designs were the Emsco Cirrus two-place tandem mid-wing monoplane, a light plane designed for sport and training purposes, and the McCarroll "Duoplane," a twin-engined cantilever monoplane amphibion powered with two Wright New Whirlwind "Five" engines mounted in nacelles streamlined into the upper surfaces of the wing. The wing is of wood and plywood construction, the skin being of three-ply birch plywood. The hull is of composite wood and metal construction and the amphibion landing gear is hydraulically operated.

Several interesting developments were seen in the Boeing Division of the exhibit of United Aircraft and Transport Co. In the main hall were shown the Boeing Model 100 which is a commercial version of the Wasp powered military machine produced by that company and the 40-B4, a five-passenger cabin biplane for either mail or limited transport use and having a convertible passenger-mail compartment. The 18-passenger tri-engined Model 80-A transport plane was shown on the grounds between the auditorium and the annex. The commercial version of the Vought "Corsair" was also shown by United Aircraft and Transport.

A Great Lakes training plane and a Taper Wing Waco biplane were suspended in various attitudes of flight from the ceiling of the main hall.

The new Curtiss Thrush, a folding wing cabin monoplane bearing some resemblance to the Robin, and also powered with the Challenger engine, was shown in the exhibit of Curtiss Flying Service.

A three place, braced monoplane of conventional construction and powered by a Wright J-5 engine, was exhibited by the Moreland Aircraft Corp. and a center wing monoplane powered with a Le Blond 60 engine and having side by side seating arrangement was displayed for the first time by Samuel Taubman. The Le Blond powered Inland Sport monoplane and the Golden Eagle Chief also were displayed for the first time at the show.

AS IS USUALLY the case, the engine exhibits were well arranged and consisted in most cases of displays of completed engines and parts to show the type of construction. A New Whirlwind Nine, with a portion cut away to show the operation, having an electric motor keeping it in constant motion, was shown by the Wright Aeronautical Corporation, which also displayed its other radial engines and the Wright Gypsy. Geared and direct drive models of the Series C Wasp and Hornet engines were shown by the Pratt & Whitney Aircraft Company.

Much attention was attracted by the Curtiss "Crusader," a six-cylinder-in-line, inverted, aircooled engine rated at 120 hp. This engine probably marks the first attempt to combine air cooling and inverted cylinder arrangement in a six-cylinder engine. Cooling is accomplished by means of an air scoop located on the exhaust side of the engine and leading air from the slipstream to the cylinders. The cam shaft, which is called an "under head" type by its designers, because of its position below the cylinder head, is driven from a vertical shaft at the anti-propeller end of the engine.

A five-cylinder radial engine having three valves per cylinder and other unusual features was exhibited by General Airmotors Company, Inc.

Many types of accessories were shown and a number of these will be described in a later issue.

Airplane manufacturers and others will be interested to know that the Hill Auto Body Metal Works, of Cincinnati, Ohio, is offering ready made cowling of the N.A.C.A. type as well as other forms of cowling and metal shapes.

Also included in the accessory exhibits were a number of Micarta units by the Westinghouse Company and an airplane engine supercharger by General Electric Company. The Goodyear "Air Wheel" was also exhibited. A valuable addition to hangar equipment in the form of a power unit designed to open and close all types of hangar doors was shown by Allen & Drew, Inc.

THE S. A. E. PROPELLER AND POWER PLANT SESSIONS

By EDWARD P. WARNER

EXCEPT for the aeronautic standard session which is an initial feature of every S.A.E. aeronautic meeting, the engineering discussions at Cleveland opened with a propeller session on Monday afternoon, followed by a meeting on power-plant topics in the evening. The general tone of the propeller session, where three papers were presented, was addressed rather to the adjustment between the propeller and the engine, and to modifications in the propeller which would make it possible to maintain good engine operating conditions at all times, than to theories of propeller design.

The afternoon session had to compete with the Air Races as an attraction and the attendance was reduced to about 50 as a result. A large proportion of the propeller experts of America was present, however. Lieut. Carl B. Harper of the Navy, who was to have presided at the meeting, was called away and Maj. Leslie MacDill, lately commanding officer of Wright Field, took his place.

Two papers were contributed on variable pitch propellers, one by T. P. Wright, chief engineer of the Curtiss company, and W. R. Turnbull, inventor of the Turnbull propeller and now consultant for Curtiss. The other author was Frank W. Caldwell, formerly in charge of the propeller branch at Wright Field and now chief engineer for the Standard Steel Propeller Company. Both papers entered into extended discussion of the general advantages of a variable-pitch propeller without regard to any particular mechanical construction. Mr. Wright and Mr. Turnbull called attention in particular to British computations showing that for a typical pursuit plane and an unsupercharged engine the ability to vary the propeller pitch at will would increase the rate of climb by 30 per cent at sea level and by approximately 75 per cent at 15,000 ft. The maximum speed in level flight would be unchanged at sea level, but increased by some 30 per cent at 20,000 ft. altitude. The authors especially stressed the benefit to be drawn from the varying of pitch at high altitudes, even without supercharging. It is a point that is frequently overlooked.

It has been commonly assumed in the past that the ideal performance with a variable pitch propeller would be secured by holding the engine r.p.m. to a constant figure for a given throttle setting at all times. Recent tests made by the Curtiss company, and first presented in the Wright-Turnbull paper, emphatically disprove that, so far as economy is concerned. Economy studies were made with a Curtiss "Robin," normally carrying a propeller of 5 ft. pitch and cruising most economically at about 76 m.p.h. and 1,450 r.p.m. An increase of the propeller pitch to 8 ft. loaded the engine down so that the same cruising speed was secured at 1,150 r.p.m., with a resultant reduction of approximately 10 per cent in fuel consumption when adjusted for the best mixture for economy. Curves given in Fig. 1, reproduced from the paper, show the relationship between economy and propeller pitch at various speeds and carburetor settings.

The results of the test indicate that in cruising it is advisable to use an even higher pitch than in level flight at maximum speed. The impossibility of accomplishing that without manual control was pointed out as a weakness in the automatically governed type of variable pitch propeller such as the Hele-Shaw, in which the governor operates to maintain constant r.p.m. for any given throttle setting.

THE AUTHORS also enlarged upon the usefulness of a variable pitch propeller for improving the take-off and in making it possible to get the full benefit from a supercharged engine. Estimates of performance for an airplane having a ceiling of 16,000 ft. without supercharging showed climb to 20,000 ft. in 32 min. with a supercharged engine and a fixed-pitch propeller, reduced to 26½ min., or a gain of 17 per cent by the ability to vary the pitch. The variable-pitch propeller was also shown to have special advantage on the multi-engined machine, as adjustment can be made to maintain the full efficiency of the surviving propellers in case of the failure of one engine. The propeller on a dead engine, too, can be set for a 90 deg. mean blade angle, so reducing the parasite resistance by an amount which the authors estimate as 40 lb. for a 9 ft. propeller at 60 m.p.h. With most variable pitch propellers so far used in flight it would be impracticable to make the angular throw large enough to permit of completely feathering blades of the propeller, as the control has been through linkages, but in the design upon which Mr. Turnbull has been engaged the drive is directly through gears and there is no limit to the amount of rotation of the blades.

Mr. Caldwell and the authors of the other paper agreed in holding duralumin to be the best material for a variable pitch propeller on present-day engines. Mr. Wright suggested, however, that steel has promising possibilities, especially in very large diameters.

Both papers devoted some attention to a recapitulation of the history of variable-pitch design and of its present status The operating mechanism of the propeller designed by T A Dicks for the Standard Steel Propeller Company is shown in Fig 3, taken from Mr Caldwell's paper It provides for manual control through linkage, and for a throttle stop to prevent passing the blades through the neutral position with the throttle open and damaging the engine by over-speeding The Turnbull propeller, to which the other paper especially related, has about six years of development behind it in approximately its present form It embodies a drive by electric motor mounted on the shaft and geared down by some 60,000 to 1, so that when the motor is running the blade angle is being continuously varied at the rate of one degree of angle every two or three seconds No throttle stop is now provided, but it is pointed out that electrical control permits of the ready incorporation of any such safeguarding devices Parenthetically, it appears to the present writer that neither the manual control, nor the continual slow changing of angle as long as the clutch is left engaged or the engine switched on, nor the automatic control by governor attains the ideal There is an opening for further inventive effort in developing a follow-up gear which will make it possible for the pilot to set a handle to any desired blade angle, the blades then being shifted exactly to that angle by mechanical or electrical power within 5 or 10 sec

On the design described by Mr Caldwell no definite figures were given, but Messrs Wright and Turnbull indicate that the Turnbull type has been brought down to a total propeller weight of 107 lb for a 200 hp engine

Neither paper made much of the possibility of pitch reversal as a desirable point, although Mr Caldwell commented on it briefly When Caldwell's work with variable-pitch propellers first began, some 11 years ago, the possibility of reversal to secure braking action in landing was highly esteemed as one of the chief merits of pitch variation, but the introduction of wheel brakes has changed the outlook

Mr Caldwell's treatment of the subject took up more detail on laboratory results than did the companion paper A group of test curves taken with a propeller approximately 9 ft in diameter indicated that a reduction of blade angle at 42-in radius from 22 to 14 deg would increase the static thrust by 40 per cent The prospective improvement in take-off is obvious

A point in variable-pitch propeller design often overlooked is the variation of stress conditions with changing angle Mr Caldwell treated this in some detail with special reference to the bending and twisting moments produced by the centrifugal force on the blade A curve of torsional moment from this source, reproduced in Fig 2, shows not only a great variation in magnitude but an actual change in sine of the movement within the probable range of angular adjustment of the propeller blades The general method of stress analysis described by Mr Caldwell is an amplification of the classically simple one given in most available texts on propeller design In particular Mr Caldwell recommended making allowance for the distinction between the minor principal axis, the neutral axis, the chord line of the blade section and the plane perpendicular to the line of applied bending moment in the section, instead of treating them all as identical as in the simple theory His stress calculations allow also for the negative bending moment produced by centrifugal force acting on the deflected blade, and call for a calculation of blade deflection, not commonly made in connection with wood propellers

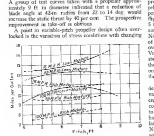


Fig 1—Curves showing relation between propeller pitch and fuel economy at various speeds Standard propeller pitch was 5 ft.

The similarity of the conclusions drawn in the two papers is interesting, especially since Mr Caldwell and Mr Wright are respectively the chief engineers for two companies that have had a large production of fixed-blade metal propellers, but neither of which has as yet actually put a variable-pitch design on the market Mr Wright and Mr Turnbull close "Inevitably the next few years will see the extensive use of the controllable-pitch propeller on airplanes of many types and on practically all airplanes of certain types" Mr Caldwell concludes "In closing I may say that the aerodynamic advantages of controllable-pitch propellers are becoming increasingly important as propeller-tip speeds and engine horsepower increase With improved materials and design, we should soon be in a position to meet the practical requirements of the problem"

In the course of an active discussion of the two papers, Commander Havill, former head of the propeller branch of the Naval Bureau of Aeronautics, and now with Bendix Aviation Corporation, took up the cause of the propeller of automatically variable pitch, especially for small planes He suggested that the feathering of the propeller on a stopped engine and the use of the propeller with a reverse pitch as a brake were of minor importance and that the purpose of pitch variation in flight required a range of angular adjustment of only 5 to 10 deg Commander Havill described a device for automatic variation now under development for the Navy which is expected to give a variation of 3 deg of blade angle with an increase of weight of only 8 lb over the fixed blade propeller The design is that of Victor Lockheed and bearings of the blade are substantially eliminated by the ingenious device of floating the blades and carrying the centrifugal forces upon them on a large number of piano wires in tension anchoring the blade roots to the hub

Mr. Caldwell expressed the belief that there was no definite limitation upon the use of manual control for varying the pitch and that it could be worked even with engines of very high power but that a power operated control would prove simpler The writer contributed to the discussion, remarks along the line of those that have been interpolated in this report Dr Max Munk, lately in charge of the aerodynamic test work of the National Advisory Committee for Aeronautics, and now with the Alexander Company, expressed great dissatisfaction with the present type of wind tunnel test of airfoil models as a basis for propeller design He indicated briefly the results of recent researches of his own showing the true lift coefficient for a section as a part of a propeller to be 40 per cent higher than for the same section tested as an airfoil, the difference being attributed to the uneven conditions of airflow about the propeller blade The acceptance of this view would fundamentally modify the bases now commonly employed in propeller design

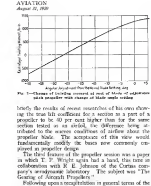


Fig 2—Change of twisting moment at root of blade of adjustable pitch propeller with change of blade angle setting

The third feature of the propeller session was a paper in which T P Wright again had a hand, this time in collaboration with R E Johnson of the Curtiss company's aerodynamic laboratory The subject was "The Gearing of Aircraft Propellers"

Following upon a recapitulation in general terms of the gain in propeller efficiency to be had by increasing V/ND through gearing, which reduces the r p m more than it increases the diameter, the authors gave specific examples of certain existing gears and installations One particular case was that of an Army observation airplane designed around the Liberty engine When the Liberty was replaced with a more modern type, giving 2 per cent more power with 170 lb less weight, but rated at 2,300 r.p.m instead of 1,800, the maximum speed dropped approximately 4 m p h The entire explanation was found in a drop of propeller efficiency of about 4 per cent, corresponding to a 20 per cent reduction in V/ND

Another point which received less attention, but upon which the paper commented at some length although with an unfortunate absence of numerical data available, is the effect of a nacelle or fuselage behind the propeller on its efficiency Gearing down the propeller, with an increase in diameter, gets the blades away from the interference region and reduces the loss from this cause Mr Wright and Mr Johnson suggested that the effect must be an important one, because gearing has in some cases produced benefits distinctly too great to be accounted for by the variation of propeller efficiency alone

Another argument for gearing was found in the increased rotational speed and power of aircraft engines which has now reached the approximate limit of safe absorption by a direct-driven propeller, even though it be made of metal A tip speed of 1,000 ft per sec was taken as representing the limit of good practice with metal blades, and it was shown that it would be impossible to keep down to anywhere near this figure with a 600-hp engine turning a propeller at 2,400 r p m The maximum permissible power input at that rate of rotation and at 130 m p h can in fact be calculated from data given in the paper to be only 265 hp Of course in some cases tip speed is allowed to exceed the figure just specified

The disadvantages of weight and cost in a geared installation were frankly recognized Fig 4, taken from the paper, shows the relationship between the weight added by gearing and the horsepower for a number of engines While the chart shows a wide variation among individual designs, the average weight increase will be seen to be about 0.2 lb per hp., which seems to this writer a very moderate price to pay for the advantages gained by gearing in many cases, especially on large and slow-flying planes Although the lowest weight per horsepower for any of the gear installations included in the chart is that of the Napier Lion racing engine, Americans will note with satisfaction that the four next best figures are those of American engines and all are stock types, not special racing designs

On the heading of cost the authors referred to the geared and ungeared Conqueror engines as showing the extra labor and material necessary for geared drive The same illustration shows, however, the advantage of gearing in centering the shaft on the engine and facilitating a better stream-lining of the nose of the fuselage or nacelle, especially when the engine is not to be run inverted

The loss of power due to friction in a gear drive is also prone to be overestimated Mr Wright and Mr Johnson indicate that it should be kept down to about 2 per cent in a spur gear drive, and 4 per cent with an epicyclic Balancing advantages and drawbacks against each other, they come finally to the conclusion "Experience shows that the net gain does not warrant the gearing of engines rated at less than 400 hp, or for airplanes weighing less than 4,000 lb Airplanes having design values of $V/ND = 0.7$ or greater, and at the same time having a propeller tip-speed less than the limit given, 1,000 ft per sec for metal and 850 ft per sec for wooden propellers, would not give an increase of performance of sufficient magnitude to warrant the added complications However, when the designed performance of an airplane does not come within the range of values stated, a designer should be hesitant about installing a direct-drive propeller

"Reduction-gearing is a refinement of design and, very often, a similar gain of performance can be obtained by using more care in attaining cleanness of the general-design characteristics of a given airplane In the past, gearing has resulted in correcting poor basic design instead of giving super-performance to an originally so-called clean design This fact should be realized by the aircraft designer before he finally decides to use gearing So far as generalization on any engineering problem is permissable, we believe that the trend in large multi-engined transport airplanes will be decidedly favorable to the use of gearing"

In the course of the discussion of this paper, Major McGill referred to the relation between gearing and cooling and to past experiences with gear reductions which had cut the performance of the airplanes because of the increased weight and area of the radiator required with a larger propeller and lower slipstream velocities He warmly appreciated the importance of gearing, however, and expressed personal conviction that it had had inadequate attention in America Mr Caminez of the Allison Company challenged Mr Wright's conclusion that engines of low power should not be geared He had found it advisable to gear them in many instances It was his opinion that the weight of gearing depended upon all the engine characteristics and especially upon the torque variations and not merely upon power Mr Caminez further expressed surprise at the mechanical efficiency given for gear drives He,

himself believed that 99 per cent should be possible Mr Insley of the Continental Engine Company expressed a doubt of the validity of any general rules about the cases in which gearing should be used a doubt with which other speakers in the discussion agreed He tended to concur in general with Mr Wright's view about the inapplicability of gears to small engines

The power plant session, which was presided over by Capt L M Woolson of the Packard company and attended by about 100 members and guests included an extended treatment of the work done on high-temperature liquid cooling by the Material Division of the Army Air Corps It was presented by Gerhardt W Frank, of the Power Plant Branch at Wright Field where he has been in active charge of the recent studies in that field

Mr Frank pointed out that the general suggestion of using liquids of higher boiling point than water for cooling cylinders has frequently been made in the past Little success was obtained until the work was taken up at McCook Field in the spring of 1923 at the suggestion of S D. Heron Mr Heron also proposed the trial of ethylene glycol which has been used ever since Laboratory experiments quickly showed such promising results that the first flight trial was made a little less than a year after work in the laboratory began Studies have now covered three types of engines the Liberty the Curtiss D-12 and the Curtiss V-1570

Owing to the more or less interchangeable use of a chemical designation and a trade name for the liquid used in the cooling and to the incomplete reproduction and inaccurate interpretation that Army releases on the subject have occasionally received, the exact history of the cooling fluid used has at times been veiled in mystery, and the impression has here and there existed that the liquid itself was a new invention Mr Frank made its true status clear He pointed out that it was discovered some 70 yr ago, that it is of the alcohol group and that it has a boiling point of 387 deg F and freezes at 12 deg F Curiously enough however the addition of a little water greatly lowers the freezing point and the mixture known as Prestone used instead of pure ethylene glycol in the Army Air Corps work was stated by Mr Frank to contain about 3 per cent of water and have a boiling point of 335 deg F and a freezing point of 0 deg F While the ethylene glycol mixture has been used in all of the works so far done, other liquids are also under investigation at Wright Field

Laboratory tests with a standard engine and Prestone used for cooling have shown according to data drawn from curves given in Mr Frank's paper and reproduced

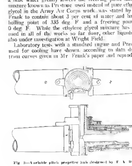


Fig 3—Variable pitch propeller hub designed by F A Dicks

in Fig 5 herewith very little effect either on brake horsepower or on fuel consumption as the temperature of the cooling liquid at the outlet from the cylinders is varied from 160 to 300 deg The power dropped about 3 per cent while the fuel consumption after having increased about 4 per cent at an intermediate temperature, fell back to its original level A curious point revealed in the paper although Mr Frank did not comment upon it in detail, was the difference between the temperatures of cylinder heads and barrels with water cooling and when cooled by Prestone at the same temperature In the cylinder heads the difference was nearly 80 deg in favor of the water cooling the cause presumably being a difference either in the heat conductivity of the liquids in the turbulence of their flow through the system and the amount of entrapped air that they carry or in conditions affecting surface transfer of heat between the liquid and the metal

The change of temperature in the liquid itself during its circuit of the cooling system of course depends primarily upon the rate of flow With the same pump used in both cases, the range of temperature in Prestone was about 25 per cent higher than water because of its lower specific heat

The next step, as described by Mr Frank was to go on to flight testing and a pursuit airplane was modified to reduce its radiator volume and frontal area as the higher cooling temperatures permitted It was found

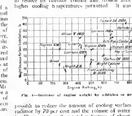


Fig 4—Increase of engine weight by addition of gearing

possible to reduce the amount of cooling surface of the radiator by 70 per cent and the volume of water carried by 40 per cent, with a total reduction of about 100 lb in the weight of the cooling installation Mr Frank described no troubles as having occurred in any of these tests except for wear and sticking of piston rings and the occasional leakage of the cooling fluid through threaded joints There have been no difficulties so severe as to interfere with continuance of the tests

The most recent development described by the author is the use of ethylene glycol for cooling a high-compression engine, using a special fuel and taking full advantage of its anti-knock properties The compression ratio of the D-12 engine used in the test was raised to 7.3, and the fuel employed was California gasoline with 11 c.c of ethyl fluid per gallon The effect of the changes has been to raise the power of the engine from 425 hp at 2 300 r p m to 520 at 2 600 r p m, and to reduce the fuel consumption from about 0 45 lb per horsepower-hour at the most economical carbureter setting to 0 40 Mr Frank summarizes the combined effects of high-temperature cooling and the use of a high compression ratio made possible by special fuel as reducing the power-plant weight per horsepower from 2 00 lb to 1 46 lb The

data given in his paper make it possible to show by further computations that the aggregate frontal area of engine and radiator per unit of power would be reduced by some 25 per cent while the complete installed weight including fuel and oil for 4 hours cruising at 85 per cent of maximum speed, would be cut approximately from 3 33 to 2.61 lb per hp The only obvious sacrifice in efficiency to set against these advantages would be the loss of propeller efficiency due to increase of rotational speed which was analyzed in the paper of Messrs Wright and Johnson

The Frank paper was followed by a prepared discussion by Mr Geisse who described work done by the Navy along the same line The speaker's attitude toward high temperature cooling was exceedingly optimistic and on the basis of his experience in the Navy researches he even predicted that the radiator could be eliminated entirely the cylinders being exposed to the air and all surplus heat disposed of directly to the air from the surface of a streamlined water jacket possibly corrugated to increase radiation surface Mr Geisse declared that Ethylene Glycol would give more uniform cooling than air and predicted that liquid cooled engines would now be brought back to a strongly competitive position with the aircooled type

In response to a question, the author of the paper stated that no trouble had been experienced with the breakdown of soldered joints in Prestone cooling systems Mr Cammez of the Allison Company suggested that good fuel economies obtained with Prestone at standard compression ratios were probably due to reduced mechanical friction losses at high temperatures The discussion was concluded by Samuel D Heron, of Wright Field, with the observation that experience had shown that engines with high temperature liquid cooling would stand, without complete collapse, abuse that would be quite disastrous to the aircooled type During the whole course of the discussion it was evident how much the question of the Diesel's possibilities is to the fore among those engaged in aircraft engine work and there were several remarks upon the availability of ethylene glycol cooling for a Diesel engine

Mr Frank's paper had been preceded by one on "Gaging Engine Performance," by J H Geisse, vice-president in charge of engineering of the Comet Engine Corp Mr Geisse's object was to provide analytical comparisons between engines of varying performance qualities to determine how particular modification in design would effect real over-all usefulness After expressing astonishment that such analyses had been so uncommon in the past the author first undertook an analysis of the effect of engine weight on operation cost, assuming the engine weight to be changed without change of any of its other qualities and the power to be increased enough to keep the pay load of the plane constant

Assuming an engine life of 3 000 hr and a total life of 6 000 hr for the airplane the effect of increasing the engine weight from 2 lb per hp to 2 47 was calculated to be an increase of $2 561 in total operating expense during the life of the airplane for a 200 hp engine Mr Geisse's next calculation related to two engines having the same weights as in the previous one but with the additional weight of the heavier engine in this instance put into increased cylinder volume making it possible to run at a higher compression ratio with lowered volumetric efficiency and mean effective pres-

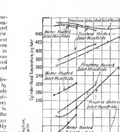


Fig 5—Effects on engine performance of change of outlet temperature of cooling

sure The light engine weighing 2 lb per hp was figured for a compression ratio of 5 and a brake mean effective pressure of 120 lb per sq in while the heavier alternative design was to have a compression ratio of 6 and a brake mean effective pressure of 98 lb In this case the heavier engine came out the better of the two on total operating cost showing a saving of $550 during the total life This was due almost entirely to lowered fuel consumption due to the higher compression ratio

The author also pointed out that even leaving the fuel consumption entirely out of consideration the increase of engine weight could be used to insure increased durability which would make up for the cost of carrying the extra weight around His final conclusion seemed to be although not explicitly so stated that the saving of weight in engine design has been overdone as an objective and that lower fuel consumption greater durability and better over-all economy might be obtained with somewhat heavier construction He closed by repeating a suggestion previously made that the power plant weight per pound of net thrust was much more important than the engine weight per horsepower and he expressed the hope that the users of engines would give more careful attention to means of gaging their true economic worth an aim which he did not believe to be accomplished by the present criteria of engine performance now generally accepted

The discussion of the paper was brief, but served to develop a marked difference of opinion on who should be responsible for engine installation and cowling design. Mr Geisse and several members of the audience believed that cowling should be furnished as part of the power plant by the engine manufacturer, while the airplane designers present preferred to keep it in their own hands In reply to questions, Mr Geisse said that he would use high mean effective pressures in his designs only if forced to do so by what he believed to be unsound and ill informed public demands

FIRST FLIGHTS OF THE *Metal-Clad Airship*

By John T. Nevill

WITNESSED by several thousand persons, including many of the best known naval and civil aeronautical engineers in the nation, the Detroit Aircraft Corporation recently test flew their metal-clad dirigible, ZMC-2, "a distinctly American airship," which they built for the United States Navy.

The craft's initial flight at this writing has been succeeded by a second one, and the builders hope to have amassed by the time this is published more than half of the 30 hours of flight required before delivery to the Navy

Both flight tests thus far made, although primary in nature, seem to have satisfied the engineers' expectations to the point to which they have been carried Due to the fact that the craft's 202,200 cu ft capacity metal hull has been only partially inflated for the flights, and because the helium in the bag is yet to be run through the drier, no definite figures on the ship's lift can be procured at this time. Official performance figures, it was said, will be issued by the Navy Department after the ship's arrival at Lakehurst.

How closely the ship's lifting performance will come to the company's forecast figures, however, can be judged from the following estimates based upon the two flights already made The ZMC-2 was designed to have a gross lift of 12,242 lb, (at 100 per cent inflation with 92 per cent pure helium at 60 deg F) 3,442 lb of which is useful load. In the initial flight it has been estimated that the hull carried approximately 180,000 cu ft. of gas and that it lifted between 2,200 and 2,300 lb of useful load, this load being made up of five men, 100 gal of gasoline, 400 lb of water, 150 lb of oil, five parachutes, and 140 lb of sand On that basis it has been estimated that when fully inflated with gas testing

The metal clad dirigible ZMC-2 as it appeared at the start of its first test flight over Detroit

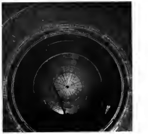
approximately 90 per cent pure (such as that now in the hull), the useful load will be increased to approximately 2,900 lb With further elimination of a major portion of the carbon dioxide and water now in the helium, the useful load is expected to rise to the neighborhood of the figure originally forecast

The process of filling the metal hull with helium was carried out in the following manner The two balloonets were first filled with CO_2, after which CO_2 was forced slowly into the bottom of the hull Due to the tendency of the gas to freeze, the connections were heated by torches Throughout this process a head of one in or more of water was maintained in the hull by restricting the exhaust openings, excessive pressure being taken care of by exhaust valves in the balloonets The air was exhausted through the top of the ship to a point outside the hangar until the exhaust line showed 99 per cent pure CO_2

The helium line was then emptied and helium admitted at the top of the ship through three manholes Exhaust gas was run through four inflation sleeves in the bottom of the hull and carried outside the building Purity samples were taken at various points in the ship and in the piping to determine the stratification and contents of the mixture When the exhaust gas showed about 40 per cent helium the exhaust was connected to the purifier The air was first forced out of the purifying plant by the exhaust from the hull The exhaust was passed through a pump in the bottom of the scrubber, caustic soda solution being circulated through the scrubber and the tanks In passing through the scrubber the gas mixture came in contact with the caustic soda, which absorbed most of the CO_2 After 99 per cent, or better, purity was found in the scrubber exhaust this exhaust was introduced in the hull at a point approximately 10 ft. above the bottom To compensate for the volume of CO_2 absorbed in the scrubber, helium was added from cylinders atop the hull When the desired purity was obtained the CO_2 in the balloonets was replaced by pure helium, filling the ship ready for trial flights.

NO ATTEMPT has yet been made to try out the ship's speed. On flights already made it was said that the craft's two 220 hp Wright engines were turning over at speeds ranging up to 1,200 r p m and that the air speed registered up to 47 m p h

Despite its stubbiness (the fineness ratio being 2.83) the ZMC-2 seems to have little of the pitching proclivities that might be expected in an airship of its size and shape The rolling tendency is even less noticeable



Interior of the bag during final inspection An extension ladder is shown running up to the upper surface of the envelope

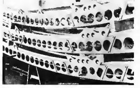
Carl B Fritsche, vice president of the Detroit Aircraft Corporation who was a passenger on the ship's baptismal flight, stated that the metal hull seemed to dampen rather than amplify the engine exhaust noise. According to Capt W E Kepner, the ship's test pilot, the new method of control gives the ship a high degree of sensitiveness and excellent maneuverability Vibration, he said, also was noticeably absent

Beside Mr Fritsche and Captain Kepner, the initial flight carried Master Sergt Joseph Bishop, Kepner's assistant, and Edward J Hill and Arthur G Schlosser, D A C engineers in charge of the dirigible's construction Lieut Comdr William K Harrill, and members of the naval board of survey, designated to inspect the ship, and Comdr Garland Fulton, chief of naval aircraft construction, witnessed the flight from the ground Comdr Fulton participated in a flight the succeeding day

Before formal delivery to the Navy is made, the dirigible will undergo a number of required tests, including a 15 ft per sec ascent under power, a 15 ft per sec descent under power, descent as a free balloon 1,000 ft in 4 min Trim, gas and air tightness, speed and reliability must be satisfactory

From an engineering standpoint, the ZMC-2 introduces three major new lines of thought, the first being its all-metal construction, the second its entirely new system of control, and the third its unusually low fineness ratio The ZMC-2 hull is 149 ft 5 in long and 52 ft 8 in in maximum diameter, giving it a fineness ratio of 2.83 It has two balloonets, the forward one having a displacement of 22,600 cu ft and the rear one a displacement of 28,000 cu ft, the two comprising approximately 25 per cent of the hull volume. The balloonets are made of two-ply rubberized fabric weighing 9 oz. per sq yd The seams are lapped ¾ in, cemented and taped but not sewn Unlike other airships the ZMC-2 carries its lifting gas directly within the hull itself, rather than inside one or more balloonets located within the hull The balloonets in the metal clad dirigible are inflated with air to regulate the gas pressure.

One is immediately impressed with the simplicity with which the ZMC-2 is constructed both inside and out. By the sheer strength and workability of metal the builders have done away with the multi-layer and complex bracing systems prevalent in modern fabric covered dirigibles. The ZMC-2 has but one skin, and that, of



Typical girders used to stiffen the interior of the metal bag

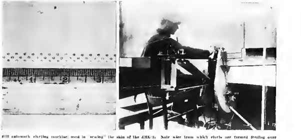
"Alclad," so thin the company was compelled to invent a new automatic riveting machine to "sew" the pieces together. The skin's gage is .0095 in., and it is not corrugated.

For gas-tightness the builders developed their own bitumastic sealing compound, which was applied inside the seams immediately after the riveting had been inspected and approved.

The ZMC-2 was built in two vertical halves, the framework on the halves progressing from the nose and stern towards the middle. Briefly, the dirigible's framework consists of 24 longitudinals of single rolled channel section and five main transverse circular frames of built-up triangular section, both being stamped out for lightness. Although seven frames of smaller section are spaced between the main transverse members to assist the thin skin in retaining the craft's shape, virtually all of the tensile stress is carried by the five main rings and longitudinals. Two of the rearmost main transverse members are used to support the ship's fins and control surfaces, which are placed 30 ft. forward of the tail. The control car, located amidships, is attached to the central main transverse rings. The fifth main ring is located well forward to take care of stresses on the nose. Forward handling lines are attached to this member. All of the framework is of duralumin, the thickness of the longitudinals varying from .014 in. to .032 in., according to the intensity of compression loads in any particular part of the hull.

Instead of the usual control surfaces near the tip of the tail the ZMC-2 has eight fins belting the hull 30 ft. forward of the stern. The ship has four rudders, one attached to each of the four vertical fins. Similarly four elevators are operated off the four horizontal fins. Total fin area is 440 sq. ft., total elevator area, 190 sq. ft., total rudder area, 95 sq. ft. and total automatic rudder area 95 sq. ft. All of the fins and control surfaces are similar in construction to those of the Ford all-metal monoplane, and all were subjected to sand-load tests. By placing the control surfaces well forward of the tail the designers hoped to utilize the smooth flow of air as near as feasible to the point where the hull has its greatest diameter. It is stated that the tests have shown that this construction favors sensitiveness in the controls and gives the ship a high degree of maneuverability. Control cables extend from the surfaces via pulleys through metal tubing welded to the hull and to the control car where one wheel takes care of the rudders and another operates the elevators. Like the control surfaces, the control car is covered with corrugated duralumin, the metal being of much larger gauge than that of the hull. Besides a large window extending across its front, the car has a window and a door on each side, as well as a window at the back. Gasoline is carried in a 200 gal. container in the rear portion of the car. A 50 gal. water tank, for ballast, is also located in the rear compartment.

Engines of the ZMC-2 are carried on tubular outriggers, one on each side of the car, and in line with the



Hill automatic riveting machine used in "sewing" the skin of the ZMC-2. Note wire from which rivets are formed feeding over shoulder of the operator. Riveting scale is shown at left

side windows. Each power plant has an independent fuel, oil, ignition and control system.

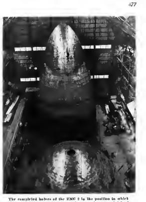
One of the most interesting features of the Detroit Aircraft Corporation's dirigible lies in its unique method of construction. It has been previously stated that the hull was built in two upright halves, after which the halves were placed horizontally and riveted together. Metal plating girding the hull was cut in strips from 6 in. to 17½ in. wide and necessarily had to be patterned with just the proper length and curvature to line up with its adjacent strips in order to allow not the slightest departure from the hull's sectional and planform contour. Beginning with end rings at the nose and at the stern, these strips were riveted to the bag piece by piece and the nose or stern, as the case may be, hoisted toward the hangar roof as the work progressed. In order to join these thin pieces with a tightness allowing a minimum of diffusion, an automatic riveting machine was used.

From a mechanical viewpoint this machine, the invention of Mr. Hill, parallels the major project and is expected to become a valuable contribution to the economi-

Front view of the car, with engine mounts and engines in place

cal construction of metal aircraft. The machine is capable of spacing, inserting and completing 135 rivets per minute, or about 40,000 rivets in one 8-hour shift. The cost per lineal foot of the seam is declared to be about the same as that of sewing, cementing and taping one foot of fabric seam. The automatic riveting machine is set on a carriage, mounted on concentric rails placed directly under each half of the hull. The machine then is adjusted to the proper angle of the hull plating, a gauging device on the machine giving a correct and uniform overlap of the plates. In its operation three strands of wire, size .035, are fed like thread into the machine and three rows of rivets are sewed simultaneously. The machine shears off the wire, rivet length, the tiny wire sections are punched through the two sheets of metal after which a revolving cam heads up the rivets. With this machine, two men are able to accomplish as much work in a given time as 128 men working by hand.

Over a five year period more than $300,000 was spent



The completed halves of the ZMC-2 in the position in which they were constructed before being tipped over and joined

in engineering research and study in developing the ZMC-2, practically all of this before Congress appropriated the $300,000 paving the way for the Navy contract. To date, according to the builders' own statement, the ship has cost about $750,000. The experimental work embraced the detailed designing of a number of hypothetical metal ships of various sizes. And on each square foot of hull surface a thorough stress analysis, involving the integration of all forces, was worked out. A metal water model, built to 1:13 scale, was constructed and tested at different angles of pitch to verify the theory of the design, as well as the theory of the main bending and shearing actions and the safety factors involved.

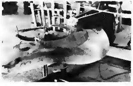
It is anticipated that all-metal construction in airships of larger size does not increase the weight as compared with fabric construction. This is due to the fact that the metal skin carries the shear stresses and a certain portion of the tensile stresses, as well as reinforcing the internal frame members, thus reducing the quantity and size of internal framing necessary. The company's research work, in which they had the co-operation of the Bureau of Standards, the Massachusetts Institute of Technology, the Aluminum Company of America and several additional agencies, furnished the following convictions:

That the new hull form and fin arrangement constitute an improvement in aerodynamic qualities. That the results of the large-size metal water-model test, checked with D.A.C.'s stress formulæ, gave practical proof of a remarkable gain in strength obtained with the metal-clad design. That diffusion of the metal hull, seamed and doped in the company's manner, was only 1/10 litre per

sq meter in 24 hours, or much less than with the best fabric constructions. That the thin sheeting and seams have a satisfactory resistance to vibration.

In fairness to the builders, it should be remembered that they make no claims of commercial value in so far as the ZMC-2 is concerned. Rather, they designed and built it as an experiment to prove the new aerodynamic and structural theories it embraces, and to prove the adaptability of metal to its dedicated purpose. The claim is advanced, however, that the metal-clad ship, constructed on a larger scale, will have a definite commercial and military value. In connection with the paper work done by the ZMC-2's engineers in 1925, it is noteworthy that the completed craft's empty weight, 8,800 lb., exceeds the detailed estimates made at that time by only 100 lb., despite the substitution of Alclad for duralumin about fifteen per cent thinner.

By way of history, it might be stated that the ZMC-2 was conceived by a group of Detroiters in 1921, who, in 1922, organized the Aircraft Development Corporation. Harold H. Emmons, who had had charge of airplane engine building for the government during the World War, was president of the corporation, and Carl B. Fritsche, vice-president and general manager. Ralph H. Upson was the company's first chief engineer, and to him goes a large share of the credit for the design. Costly and heartbreaking experimental work consumed the first four or five years. A Navy contract was signed in the fall of 1926, and actual construction of the present experimental airship was begun immediately thereafter. The change to Alclad was made a little less than two years ago. Just recently the Aircraft Development Corporation became the nucleus of the Detroit Aircraft Corporation, operators in a wider field. Edward S. Evans is president of Detroit Aircraft Corporation and Mr. Emmons is chairman of the board.



Riveting the first sections of the nose-cap of the dirigible

The ZMC-2 ready for inflation, with helium cylinders laid out and hose in place

OVERHAULING *OX-5 Crankcase* AND *Cylinder* ASSEMBLIES

BY JAMES P. WINES

The Last of a Series of Three Articles About the Service Organization of Parks Air College

THE RIGID inspection and maintenance system in force at Parks Air College, Inc., East St. Louis, Ill., for the purpose of keeping the OX-5 power plants used in the school training planes in operating condition and the methods employed in performing major overhauls on the crankcase and cylinder assemblies were discussed in the first two articles. In this, the last of the series, the processes in the overhaul of the accessories and the system employed in running in the engines after overhaul will be taken up.

A section of the motor service department at the Parks plant

The carbureters of the OX engines are practically rebuilt by the Parks service organization. "Murphy" Shedenhelm, who is the service manager, realizes that the improper functioning of a carbureter may easily be responsible for a forced landing; and while the rebuilding entails considerable expense, Murphy reasons that the added cost is more than wiped out by the lessened danger of forced landings. In fact, he says that the school must have engines which are in such good condition in all respects that "they won't quit" regardless of the cost of overhaul and upkeep.

The first step in the overhaul of a carbureter, of course, is its complete disassembly. The seat of the needle valve is then examined, and is replaced if it is found to be worn in the slightest. New weights, new pins and a new needle are always installed. Incidentally, it is standard shop practice at the Parks school to secure the pins in the weight assembly by soldering them. The float chamber cover is replaced if it is worn where the needle passes through, while the float itself is always replaced, if it is old, without regard for its condition. The replacement of the float naturally saves the Parks organization a great deal of trouble. Next, the collar on the needle valve is located by measurement, and the float assembly is put together.

The carbureter body is then inspected for wear, and the butterfly valves and the shaft are checked. These parts are replaced if they are worn perceptibly. To insure a richer mixture when idling, so that the engine will not cut out as is sometimes the case when the throttle

is fully closed a $\frac{3}{32}$ in hole is drilled just above the butterfly valve in each barrel The examination and replacement if necessary of the high speed compensator and cap jets forms the next step This is followed by the installation of special brass wells one inch deep below the jets, instead of the usual type These wells have been found to save a great deal of "grief" as the danger of water in the gasoline is minimized by their use The altitude tubes are next plugged with corks and are fastened in place with safety wire Mr Shedenhelm says what is quite true that there is no point in keeping the altitude adjustment since a plane equipped with an OX 5 engine seldom gains sufficient altitude to make use of it

The assembly of the air horn and the choke shutter follow as the next step The carburetor is then placed on one of the overhauled engines and is checked throughout the operation of running the engine in It might be added that in the overhaul of a carburetor if any of the ears on the aluminum case are found to be broken, they are reconstructed with aluminum solder prepared according to the U S 808 formula The new portion is then remachined and the holes are redrilled Also the setting of the collar on the needle valve is checked by actual test before final assembly so that the gasoline level is $\frac{1}{16}$ in below the top of the high speed jet

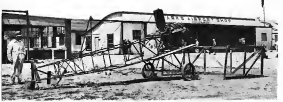
The water pump on an engine going through overhaul at the Parks shop likewise is completely torn down for inspection New bushings for the drive shaft are always used while the other parts are replaced only if they are worn The bushings are bored to allow a clearance of 002 in after the diameter of the shaft has been accurately ascertained with the use of micrometers End play of 002 in on the shaft which is regulated by the insertion of special washers is also allowed After this work has been performed the pump is repacked and assembled All the holes but one are plugged up, and the pump is tested for leaks by attaching a water hose

In overhauling one of the Berling magnetos with which most OX-5 engines are fitted the first step is that of testing it on the Weidenhoff stand which is a part of the shop equipment In this test the condition of the condenser, the winding and the magnets is noted The shaft is also checked for end play The magneto is then torn down, and the armature and condenser are tested separately The high tension parts are next tested by means of a high tension coil

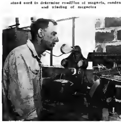
Following these tests, any faults that have been discovered are corrected at once The bearings are then inspected for unevenness or cracks and if suitable for further use, are retained If not new bearings are substituted and the magneto is assembled The bearings in the assembly operation, are packed with a mixture of vaseline and Mobile "B" engine oil It has been found that the mixture used will not harden as do some lubricants, although it is necessary to loosen it up with two or three drops of oil after every 15 hr of operation

The next steps in the overhaul of a magneto are per-

An aerial view of the Parks Airport showing the hangars, dormitory and other buildings



Above—The portable fuselage test stand used to test run the finished engines Below—The Weidenhoff test stand used to determine condition of magnets, condenser and winding of magnetos



haps the most interesting. The distributor gear is set $\frac{1}{2}$ in retard of its usual position Then a new Bosch "ZU" breaker assembly is taken and the taper is changed to fit the shaft of the Berling armature after which it is mounted with the hexagon mounting screw The arms on the regular Berling breaker box are then sawed off, while the arm lobe is notched to slip over the advance stop pin of the Bosch breaker assembly By this means the box is located in the proper position Next, the breaker points are adjusted, leaving a clearance of 018 in, and the position of the distributor pencil on No 1 electrode is checked with the breaker points just opening This is to make sure that the pencil is over at the time the points break.

At the conclusion of this work the magneto is again placed on the Weidenhoff test stand, which has a gap assembly, and a break-down test is made It might be said that the Weidenhoff test stand like the Storm connecting rod boring tool and aligner, is a highly prized piece of equipment in the Parks shop It will not only test almost every type of magneto, but it has a cut-out and auxiliaries for testing battery ignition systems The device is used, not only in performing general overhauls on the magnetos, but for testing them as a part of the regular 100 hr inspections of the engines and planes Mr Shedenhelm says the reason Parks Air College has but one forced landing on an average in every nine-month period because of magneto trouble, is the result of the use of the Bosch breaker and this test stand

At any rate, a magneto that has been overhauled is placed on the stand and is run at from 500 to 3,600 r p m. for some minutes During this run, the bearings are checked to see that they are not overheating while a check is also made to see that there are no leaks in the electrical circuits If the magneto throws a maximum hot spark for 15 min. and no end play has developed, it is returned to the engine from which it was removed The engine is then tuned

With the replacement of the magneto, the wiring is hooked up and the engine is ready to go to the test stand The stand in use at the Parks school is particularly interesting, since it is an uncovered fuselage of welded steel, constructed by the students in the welding shop It has a landing gear and tail skid A fuel tank and a radiator are located just back of the engine mount, and behind this is an improvised instrument board, having a tachometer, a water temperature gage and other necessary instruments An open switch with a porcelain base is used as the ignition switch, while the throttle control is carried back to approximately its normal position in reference to what would be the pilot's cockpit On both sides of the fuselage, supports have been arranged to hold heavy planks which extend from the nose to a point behind the instrument board These planks act as sidewalks for the men in charge of running the tests on the overhauled engines

The advantage of the fuselage test stand, though, lies in its portability When an engine has been overhauled and is ready for test, the test stand is wheeled into the shop and there the engine is mounted on the bearers The gasoline and water connections are made as well as those to the instrument board and switch A standard Hartzell wooden propeller, instead of a club, is mounted on the shaft, and the fuselage is wheeled outside to start the test When the stand is in the proper position, a

bucket filled with sand is attached to the tail to hold it down, chocks are placed in front of the wheels, and a guard rail, constructed of wooden strips and wire fencing, is placed in front of the propeller. The tail rests on the ground. When the running in process has been completed, the fuselage may be wheeled to any place where the newly overhauled engine is wanted, saving a great deal of unnecessary handling. Another thing is that the idling speed is checked, of course, when the engine is tested. In this, Mr. Shedenhelm points out, it is highly advantageous to have the engine mounted in the position in which it will be installed in a plane.

An overhauled engine is first run at from 300 to 500 r.p.m. for about three hours, or until the water temperature climbs to 140 deg. F. The throttle opening is then advanced by easy stages until the engine is turning over 800 r.p.m. It is operated at this speed for three hours if the water temperature does not exceed 150 deg. F. Next, the engine is given sufficient "gun" so that it turns up 1,000 r.p.m. In many cases, the water temperature will jump almost immediately to 180 deg. F. If this happens, the engine is throttled down until it runs at 160 deg. F. and the throttle opening is slowly advanced until the engine will run at that temperature at 1,000 r.p.m. It is kept running at this speed for three hours. Following this, it is operated for an hour at 1,100 r.p.m., another hour at 1,200 and one-half hour at 1,280 r.p.m. The engine is then idled for five minutes, after which the throttle is operated for ten minutes as it would be normally in flight. The next five minutes, the last in the test, are run at full throttle. If the engine turns up 1,400 r.p.m. with the Hartzell propeller, while the water temperature remains at from 160 to 180 deg. F., it is approved after it has been idled once more and inspected.

A very important point in the lubrication of an engine, during the process of running it in, and also in its operation later in a plane, is the use by the Parks organization of what is known as "Upper Cylinder Oil." This oil has not yet been placed on the market commercially; in fact, it was just by chance that the Parks school came across it, so to speak. Mr. Shedenhelm says the inventor, a Mr. Shaw, who lives across the river in St. Louis, came out to the Parks Airport one day and announced that he had an oil for lubricating valve stems so that they would not stick. The oil, he insisted, would not burn, and, consequently, would leave no carbon deposit. It was to be mixed with the gasoline in proportions of one ounce of the oil to every five gallons of fuel.

Mr. Shedenhelm admits that he was skeptical of the inventor's statement. However, they conducted a test by pouring a small quantity of Upper Cylinder Oil and a small quantity of ordinary engine oil into a pan. An attempt was then made to ignite both deposits. The engine oil burned, but the Upper Cylinder Oil would not. As a further test, two ounces of the cylinder oil were placed in the fuel tank of one of the OX-5 powered training planes together with five gallons of gasoline, and the plane was taken up for a hop by one of the pilots. Mr. Shedenhelm said that the reason for using double the amount of cylinder oil required was to determine its value once and for all. When the plane was landed, he made an inspection of the valve stems and guides. The stems, he says, had the sheen that all mechanics hope to keep, but that none ever does. As a result, one ounce of Upper Cylinder Oil is now used with every five gallons of gasoline that go into one of the Parks Air College engines. In addition, a quart of Upper Cylinder Oil is mixed with every three and one-half gallons of crankcase oil when the engines are run in.

The cost of overhauling an OX-5 engine at the Parks school varies from $150 to $350, depending, of course, on the condition of the engine when it is received at the shop. While the costs vary to this extent, Mr. Shedenhelm believes that a profit could be made if outside work was accepted and a charge for overhauling an OX engine of $250 was made. In the second article, mention was made of the fact that the Parks service organization, with its staff of eight mechanics which is augmented by the employment of advanced students in the mechanics course, is overhauling the large number of OX engines now on hand at the school as rapidly as possible. The purpose of this is to provide spare engines for the school training planes, to provide engines for installation in the Parks P-1 biplanes, which are soon to be placed in production by Parks Aircraft, Inc., and to provide a sufficient number of engines for the inauguration of an overhaul service for the owners of planes powered with OX engines.

According to the present plans the engine service will be similar in some respects to that which it is possible to obtain on automobile batteries at the present time. That is to say, the owner, whose engine needs overhauling, will fly his plane to the Parks Airport. The plane will be wheeled into a hangar and in just the time that it takes to jerk one engine and install another, he will be on his way again with a newly overhauled OX-5 engine. The engine which he flies away is his. For the $250, or whatever the standard charge may be, and his old engine, the ownership of the overhauled power plant will have been transferred to his name. The old engine will then be overhauled, and, in turn, will be transferred to someone else.

It is argued that this type of service will not appeal to a plane owner who has a "good" engine in his plane. However, Parks officials feel that once the standard of the service work becomes known, there will be no reluctance on the part of the owners in parting with their engines. They argue that an engine overhauled by their service organization is even better than a new engine. Incidentally, the reason the plans for the engine service are being laid so as to require that the engine, which is traded in, be flown to the field by the owner in his plane, is to make sure that the engine is in operating condition. That this is essential may be seen by the comparatively low price for which Mr. Shedenhelm believes that the service can be rendered.

It is not known just how soon the Parks organization will be able to inaugurate its engine service. In accordance with the Department of Commerce regulations, Parks Air College will have to maintain an overhaul shop solely to conduct the work required on the engines and planes used in training. That will mean the formation of a separate unit to handle the service work, and an enlargement of the mechanical staff. It is known that the service will be inaugurated as soon as possible, that eventually the Parks organization hopes to have service stations at the principal airports throughout the country, and that Mr. Shedenhelm, as service manager, is now attempting to develop tools for overhauling radial air cooled engines with the same degree of accuracy and efficiency now evident in the work performed on the OX-5 power plants.

GENERAL NEWS

"Sun God" Flight A Distance Mark

Mamer Covers 7,200 Mi. In Airsedan Refueling Trip

SPOKANE (WASH.)—Breaking all distance records for sustained flight, the "Spokane Sun God," piloted by N. B. Mamer and Art Walker, was landed here after completing a non-stop trip across the continent and back in 115 hr. 45 min. 10 sec. The Buhl Airsedan, powered with a 300-hp. Wright J-6 engine, was refueled at eleven points along the way: Oakland, Calif., Rock Springs and Cheyenne, Wyo., North Platte, Neb., Cleveland, New York, Cleveland, St. Paul, Aberdeen, S. D., Butte and Missoula, Mont. A final demonstration of refueling was made before the plane was landed at Felts Field, and the pilots signified their willingness to continue but officials of the National Air Derby Association, which sponsored the attempt, decided that ample proof of the practicability of refueling on cross-country flights had been given and that there was no need to continue.

Approximately 7,200 mi. were covered at an average speed of 62.2 m.p.h. despite loss of time in refueling, circling the airport at Rock Springs all one night to avoid a storm, and similar delay because of a storm near Bellefonte, Pa. Only 22 hr. 58 min. were required on the return trip from the time of departure from New York to the time the plane arrived over Spokane, making the average speed close to 100 m.p.h. Considering the conditions, this compares not unfavorably with the record of 19 hr. 10 min. 32 sec. for a flight from New York to Los Angeles set by Captain Hawks last June. The distances are approximately the same.

The 7,200 mi. covered between measured points without stopping exceeds not only the airplane record of 4,764 mi. made by Ferrarin and Del Prete but also the 6,880 mi. covered by the Graf Zeppelin on its recent trip from Friedrichshafen to Tokio. Of course no refueling marked the latter flights.

The refueling was carried out by planes from Mamer Air Transport, and others furnished by Texas Oil Company. "Texaco" aviation gasoline and airplane oil were used throughout the trip.

Announce Indiana Tour Stops

INDIANAPOLIS (IND.)—Plans for the first annual all-Indiana air tour have been announced. The flight will start here Sept. 16, cover a route with overnight stops at Evansville, Terre Haute, South Bend, Fort Wayne, returning Sept. 20. It is expected that between 20 and 30 planes will start.

Clarence M. Young Nominated As MacCracken's Successor


Maj. Clarence M. Young

Major Will Assume New Duties on Oct. 1

WASHINGTON (D. C.)—Maj. Clarence M. Young, Director of the Civil Aeronautics Branch of the Department of Commerce, has been nominated by President Hoover to succeed William P. MacCracken, Jr., as Assistant Secretary of Commerce for Aeronautics. Mr. MacCracken's resignation was handed to the President on Aug. 15, and will take effect Oct. 1.

After being notified of his nomination, Major Young made the following statement: "I thoroughly appreciate the honor which the President is conferring because the position of Assistant Secretary of Commerce for Aeronautics is an exceedingly important one. Civil aviation in the United States has made remarkable progress during the past three years under the very able direction of Secretary MacCracken and it is hoped and planned that the same constructive relationship between the aviation industry and the department of Commerce will continue during the succeeding years."

Major Young served as an aviator in the Army Air Service for eighteen months during the war, and he was shot down over the Italian front, being made a prisoner for five months. He is now commanding officer of the 313th Observation Squadron in the Air Corps Reserve. After the war he devoted himself to commercial aviation for several years, was secretary of the contest committee for the National Air Races of 1926, and a member of the aviation committee of the Sesqui-centennial Exposition.

Developed Aeronautics Section

He was appointed Chief of the Air Regulations Division of the Aeronautics Branch Sept., 1926, in which capacity he built up the aeronautics inspection force which is now carrying out licensing, identification and inspection of civil aircraft, and also licensing of pilots and mechanics and the enforcement of air traffic rules. He also directed the final preparation of the Air Commerce Regulations which were promulgated as a result of the Air Commerce Act, 1926.

He was appointed Director of the Aeronautics Branch July 5, 1927, and has served in that capacity up to the present. He is a member of the Yale Clubs of New York and Washington, and of the Society of Automotive Engineers.

Mr. MacCracken, the retiring Assist-

(Concluded on Page 488)

Manufacturers to Select Own Detroit Show Space

DETROIT (MICH.)—Manufacturers are to have the opportunity to draw for and select their own space, the selection to be made in the order of receipt of application, in the third annual All-American Aircraft Show, scheduled here April 5-13, 1930, according to Ray Cooper, manager. The Aeronautical Chamber of Commerce has sanctioned the display as a Class B exposition.

Manufacturer-members of the Aeronautical Chamber who have filed space applications were scheduled to choose their respective locations from floor plans presented at a meeting of the commercial manufacturers' section of the Chamber at Cleveland during the National Air Races. Mr. Cooper announces that 12,350 sq. ft. of space have already been asked.

Detroit next year will stage its show in a new $1,000,000 terminal and exposition building now being erected at the City Airport. The building will be 1,000 ft. long and 200 ft. wide, affording a clear area, except for one line of columns extending down the center. Doors facing on the airport will be from 100 to 150 ft. wide, allowing entrance of the largest transport planes without dismantling. The building will be of brick and steel, with cut stone trimming, and may be finished by December.

Graf Zeppelin Flies Over Pacific to U. S.

LOS ANGELES (CALIF.)—Completing the third leg of its round-the-world flight the Graf Zeppelin was landed here at 9:11 a.m. New York daylight saving time August 26. The 5,800 mi. from Tokio had been covered in 78 hr. 58 min. Since the dirigible cruised over this city for nearly 4 hr. before descending to be fastened to the mooring mast the average flying speed for the trip was close to 80 m.p.h. This is a little better than her best average for the Atlantic crossing and considerably faster than the average speed made between Friedrichshafen and Tokio.

If Commander Eckener follows the plans announced as AVIATION goes to press the passengers on the Graf Zeppelin may break the record for a trip around the world which is held at present by John Henry Mears and Linton Wells who completed the journey in a few hours less than 25 days. The dirigible left Lakehurst at 11:39 p.m. August 7. According to the first tentative schedule it was not expected to get back until September 3.

No trouble reported

No serious trouble has as yet been encountered. Two struts of a rear gondola were broken as the dirigible was being taken out of its hangar in Tokio August 22 causing a day's delay, but the damage was not otherwise important. The airship also successfully rode out a severe electrical storm during the first part of its journey out over the Pacific.

The Zeppelin's actual time for crossing the Pacific from leaving Tokio until the arrival over San Francisco was 68 hr. 12 min. This is less than one-third of the time required by the fastest trans-Pacific steamship and the saving is thus considerably more important than the difference between the speed of the Graf Zeppelin and the steamships "Bremen" or "Mauretania" across the Atlantic.

Makes fast time

The actual flying time thus far on the world trip has been 236 hr. 15 min. or 9 days 20 hr. 15 min. and the elapsed time has been 18 days, 9 hr. 37 min. The distance covered is approximately 16,880 mi. so that the actual average flying speed was about 71½ m.p.h. and the average speed about 38¼ m.p.h. disregarding stops.

In order to lighten the airship during its trip from Los Angeles to Lakehurst and to make room for other passengers and mail or freight, eight members of the crew will make the journey across the United States via Transcontinental Air Transport. The dirigible was refueled at Tokio and Los Angeles with Pyrofax supplied by Union Carbide Company. Pyrofax is a hydrocarbon gas which when mixed with a small amount of oxygen to correct the specific gravity has properties similar to the Ethane which was supplied to the Zeppelin at Lakehurst.

Aviation Code Discussed

MINEOLA (L. I., N. Y.)—Proposals for an aviation code for uniform state legislation were discussed here at a meeting called by District Attorney Elvin N. Edwards of Nassau County. It was proposed to make a felony of infractions of certain air rules governing reckless flying including a rule against flying while intoxicated. The code will be submitted to the State Legislative Committee for Aeronautics and other bodies after which it will be considered further at a similar meeting to be held soon.

Heavy Penalties Face Unlicensed

OAKLAND (CALIF.)—With California's new aviation law now in force Sheriff Burton F. Becker of Alameda County has announced that his deputies have been instructed to be on the look-out for itinerant fliers in unlicensed planes. Six months in the county jail and a fine of $1,000 is the maximum penalty for flying unlicensed aircraft in California.

To Tour Through East With Boeing Transport

SEATTLE (WASH.)—P. G. Johnson president of Boeing Airplane Company announces that following the Cleveland show the Boeing 18-passenger transport on exhibition there will be sent on a tour of large eastern and middle western cities.

The plane will be flown by Erik Nelson, round the world flier, who is now sales manager of Boeing Airplane Company, and he will be accompanied by Harold Crary, advertising and publicity manager of the various Boeing companies. A definite itinerary will be announced after the show.

The first of the fleet of Boeing transports coming through the Seattle factory have been purchased by Boeing Air Transport, which will place them in service on the San Francisco-Chicago route in October. Other craft of this type will then be given to the sales department for disposal. The entire fleet is coming through the factory rapidly and the company will be able to make early deliveries of these planes.

Thousands Apply for Licenses

WASHINGTON (D. C.)—Increasing number of applications for pilot licenses shows that America is very definitely taking to the air, according to statistics made public Aug. 28 by Clarence M. Young, new Assistant Secretary of Commerce for Aeronautics. Applications for the first six months of 1929 numbered 14,850.

Five States Pass Laws For License Regulation

WASHINGTON (D. C.)—Within the past ten weeks five states have passed laws regulating the licensing of planes and pilots, according to reports received by the U. S. Chamber of Commerce, which organization has been active through its local chambers in pushing legislation which will make state laws governing inter-state and intra-state aviation conform with the rules of the Department of Commerce. The types of state laws now in force may be divided into four classifications: (1) The nineteen states requiring Federal licensing for all flying within their jurisdiction. The recent additions to this group are California and Wisconsin. (2) The seven states requiring Federal licensing for commercial flying. Arkansas and Missouri being the latest to enact provisions to this effect. (3) The seven states specifying either state or Federal licenses. New Hampshire being the newest arrival in this group. (4) And the six states requiring licensing under their own systems.

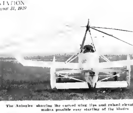
This leaves only nine states in which at the latest available report, flying regulations had not yet been provided. These are Alabama, Georgia, Kentucky, Louisiana, Nevada, Oklahoma, South Carolina, Utah and Tennessee. State legislation has been one of the major points of discussion at recent aircraft conferences. F. J. Stewart, in charge of aeronautics for the Transportation and Communication Department and secretary of the aeronautics committee for the Chamber believes that the enactment of adequate regulations throughout the nation should be only a matter of time.

Approve Three More Schools

WASHINGTON (D. C.)—New schools receiving Department of Commerce approved school certificates for the training of transport, limited commercial and private pilots are T. C. Ryan Flying School, San Diego and the University Aviation Schools at St. Louis and Kansas City. Other schools which have received approved certificates are: Air-tech Training School, San Diego; Aero Corporation of California, Los Angeles; Curtiss-Reynolds Flying School, Chicago; Parks Air College, East St. Louis, Ill.; D. W. Flying Service, Leroy, N. Y.; and the Universal School at Minneapolis.

Kari-Keen Buys Dakota Firm

SIOUX CITY (IA.)—The Dakota Airplane Company, Aberdeen, S. D., manufacturers of Fahlin propellers, has been purchased by the Kari-Keen Aircraft, Inc. of this city which will organize a $50,000 subsidiary, the Kari-Keen Propeller Company, Inc., to handle operation of this division of the airplane manufacturing unit. O. Fahlin will transfer to this city with the machinery and equipment and will supervise operations of the plant under the new ownership.



The Autogiro showing the curved wing tips and raised elevator. The latter makes possible easy starting of the blades

Organize Concern To Start New Airline

PORTLAND (ORE.)—Construction of a 30 passenger plane to be known as the Airoliner is contemplated by Portland Airplane Corporation, organization of which has just been announced. The venture is indorsed by the Chamber of Commerce and has the chamber's vice president, Edward J. Swindells, as its president.

The machine is a monoplane with a sharp nose reaching far forward and a widely bulging cabin which cuts back to normal fuselage width at the trailing edge of the wing. One motor will be in the nose and two others set pusher-position on the wings. Wingspread will be 94 ft. Plans for the giant ship are held by V. W. Strode, Portland, who is named a director, general manager and secretary of the corporation. Patents on new construction are pending.

Other officers and directors of the company are George W. McMath, railroad executive, who is director and treasurer; William F. Prier, president of the Oregon Brass Works; Bruno P. Johns, furniture manufacturer; R. M. Davisson, retired furniture manufacturer, and E. W. Hammer, said to be builder of the first seaplane constructed on the Pacific Coast, and former managing owner of the Willamette Pattern works. Hammer will be production manager. He was a former associate of Silas Christoffersen and Lincoln Beachy. Fred Jones is acting resident engineer.

Air Corps Gets More Men

WASHINGTON (D. C.)—In order to provide the necessary force of enlisted men for the Army Air Service the War Department recently ordered five inactive battalions of infantry to be disbanded and their enlisted personnel transferred to the Air Service constituting the third annual increment called for in the five-year Air Corps expansion program. The 1,421 men thus added to the Air Corps are part of the entire increase of 2,515 men to be transferred from other arms during the year.

Wright Field Gets Planes

DAYTON (OHIO)—Actual transfer of the planes of the flying section at the Air Corps station here has been completed. The flying section has been moved from the field at the Fairfield Air Depot at Fairfield to the new Wright field.

Great Southern Buys Four Flamingo Planes

CINCINNATI (OHIO)—Metal Aircraft Corporation has received a contract to manufacture all planes which will be used in the new transcontinental air line to be placed in operation soon by Great Southern Airways, Inc., according to the joint announcement of Charles M. Hatch, president of the new line and H. C. Yeiser, Jr., of Metal Aircraft Company.

The contract calls for an initial delivery of four "Flamingo" all metal cabin monoplanes with Hornet engines which are to have a speed of 150 m.p.h. The western division of the new airway, Los Angeles, Phoenix, El Paso and Dallas, will be in operation about Oct. 1. According to present plans the eastern division will extend from Dallas to New York via Richmond, Va., Washington, D. C. and Philadelphia, Pa.

ZMC-2 Flies to Cleveland

DETROIT (MICH.)—The Navy metal-clad airship ZMC-2 flew from Detroit to Cleveland and back August 25 with Edward S. Evans as the passenger to Cleveland and E. P. Warner returning to Detroit. The airship maintained a speed of 59 m.p.h. with her two Wright J-5 engines turning 1,450 r.p.m. At this speed no vibration of the metal skin was perceptible except for a slight amount on one small area in the plane of one propeller. Control stability and maneuvering power with the eight tail control surfaces were entirely satisfactory. The new airship has had nine hours of flying time so far, and no adjustments or changes of any kind have been necessary.

Latest Autogiro Flown at Philadelphia

PHILADELPHIA (PA.)—The latest type of Autogiro was given its first public appearance by Juan de la Cierva, Spanish inventor of this type of aircraft, at Pitcairn field, Bryn Athyn, near Philadelphia on August 22. Coming to an almost dead stop after going about 100 m.p.h. Cierva dropped his windmill plane gently to practically vertical landings after some half dozen flights. The plane had been flown only 10 min. before being packed in England for shipment to this country.

This Autogiro has a fuselage 15 ft. long and an air cooled "Genet Major" engine of 100 hp. The two small wings have tips which are bent up to increase the lateral stability of the craft while in the air. The four blades of the "windmill" are set in motion by air from the propeller which is thrown up to the horizontal propeller by a deflector, mounted above the horizontal stabilizer placed at the very end of the fuselage. The power thus gained rotates the vane about 130 r.p.m. which speed must be attained before the plane takes off and which was secured in other models by taxiing the plane up and down the field. The windmill swings in a 30 ft. circle.

Among those present at the exhibition flights were Jose Brana Rodriguez, Spanish vice-consul here, and Harold F. Pitcairn, president of the Pitcairn Cierva Autogiro Company which holds all North American rights to the machine and with whom Mr. Cierva is staying.

This Autogiro was to be taken to the Cleveland Air Races. Mr. Pitcairn is planning to enter two or four Autogiros in the National Air Tour in October while Cierva is having another plane sent over from France to compete in the Guggenheim Safe Aircraft contest.

Nebraska Tour Stops Named

LINCOLN (NEB.)—Towns certain to be included on the itinerary of the Nebraska Air Tour starting the week of Sept. 9 are: Omaha, Hastings, Grand Island, Norfolk, Columbus, Holdrege, McCook, Lincoln, York, Kearney, Fremont, North Platte, Falls City and Beatrice. Major Houghland, flight commander of the tour, has named Andrew Nielsen and Laurence Brumingir, Omaha pilots, as assistants and the following six men as technical assistants: Donald Halley, Frank Grace and E. D. Fox, all of Omaha; Walter Smith, Grand Island, Neb.; Orville W. Haines, Lincoln, Neb.; and A. A. Risser, Norfolk, Neb.

Boeings Use N.A.C.A. Cowlings

SEATTLE (WASH.)—N.A.C.A. cowlings are employed on all three of the Hornet engines powering the new 18 place Boeing transport. Propellers of the three-bladed type are used.

Test Hodkinson Tri-Engined Plane

GLENDALE (CALIF) — Successful flight tests of the new Hodkinson transport plane were conducted from the Grand Central Air Terminal, in this city, Aug. 17, and it was planned to fly this plane to Cleveland for exhibit before the close of the races. The machine is powered with three Curtiss Challenger engines and carries six passengers in a de luxe cabin and two pilots in a closed cockpit built high in the nose. It is of sesquiwing type and has one engine in the nose with wing engines mounted in nacelles carried on the lower wing. Top speed of the Hodkinson plane with full load is 123 m p h, landing speed approximately 45 m p h, and service ceiling 11 500 ft.

Designed primarily to provide a small transport plane of the safest possible type and as much comfort as possible for passengers, the Hodkinson transport has many features of interest. There are two doors to the passenger cabin, two to the pilot's cockpit, and a door connecting the compartments. Pilot's visibility is unusually good due to the shape of the cabin and position of the cockpit. A pressure fire extinguishing system is incorporated in the design. Individual ventilators and reading lights are provided for each passenger, ad justable reclining chairs and a fully appointed lavatory. Construction is of conventional type with steel tube fuselage and wood wings fabric covered.

Turner Fails to Break Record

LOS ANGELES (CALIF) — Although failing to break the transcontinental record established by Captain Hawks, Lieut Col Roscoe Turner arrived here in the excellent time of 23 hr 59 min 42 sec with his mechanic, Russell Pecht, and three passengers. He had previously made the trip to New York carrying the same load in 19 hr 35 min. The Lockheed Vega plane which had been taken from regular service on Nevada Air Lines was landed to take on fuel at Albuquerque N. M., Tulsa, Okla, Louisville Ky, and Cincinnati, Ohio, on the eastern trip. Louisville was omitted on the return journey but an extra stop at Tulare Calif. was made necessary by severe head winds. Colonel Turner received his promotion from a captaincy in the Nevada National Guard in recognition of his achievement.

Boeing Delivers F-4B's to Navy

SEATTLE (WASH) — Boeing Airplane Company has delivered seven Boeing F-4B single seat, high speed fighting planes to the United States Navy. These planes are part of an order being completed by Boeing for the Navy. Delivery was made in an unique fashion. The seven planes, valued at $140 000, were loaded on a barge at the Boeing factory is on tide water. The barge was floated tn the Navy air base 8 mi distant.

Curtiss Forms Women's Division

NEW YORK (N Y) — A woman's department of the Curtiss Flying Service, an innovation among companies of this kind, was announced last week by C. S. Jones, president of the company, in the appointment of Miss Clara Trenckmann. Mr. Jones stated that this department has been created as a clearing house for information for women who are interested in flying in any and all of its phases as well as in the professional opportunities it presents to them. In view of the many women students at the Curtiss schools all over the country, and the widespread interest in the first National Women's Air Derby Mr Jones believes that this Woman's department is an absolute necessity.

Third Alaskan Firm To Aviation Corporation

NEW YORK (N Y) — Further extension of its activities in Alaska is announced here by The Aviation Corporation, which recently purchased two air transport companies in that territory. A third Alaskan firm has been acquired.

Carl Ben Eielson, company representative and polar flier who has done much to develop Alaskan aviation, has wired Graham B. Grosvenor, The Aviation Corporation president, that he has bought Anchorage Air Transport for Alaska Airways, Inc., newly formed Aviation Corporation subsidiary of which Eielson is executive vice-president and general manager. The sum involved was not revealed.

Anchorage Air Transport derives its name from the town of the southern coast of Alaska from which it operates its passenger and freight planes. Bennett Rodebaugh Company of Fairbanks and Wien-Alaska Airways of Nome and Fairbanks were the firms initially acquired.

Motor Club Has Air Branch

PHILADELPHIA (PA) — William Penn Motor Club, this city, has formed an aviation division. Nearly 600 persons have already joined the new activity which is given free to members of the club. A 40 weeks ground course will be the first feature and will probably be started about the middle of September. This work is designed especially for boys from fifteen to twenty who would be unable to pav for aviation courses, but there are some adults in the group. Russell L. Davison, a former lieutenant in the Navy Flying Corps, during the war, has charge of this new work.

To Direct Airship Program

AKRON (OHIO) — N F. Hertzer, who has been a member of the Goodyear Tire & Rubber Company's Aeronautics Division since early this year has been appointed manager of the commercial development of the firm's lighter-than-air program. Mr. Hertzer joined the Goodyear company in 1915 as a general line salesmen at Louisville.

Test "Los Angeles" As Airplane Carrier

LAKEHURST (N. J.) — Apparatus for picking up and launching a standard military pursuit plane was successfully demonstrated by the crew of the 'Los Angeles" in four tests Aug 20 and 21. With the exception of one test made in July, this is the first time that a Service plane has been handled successfully and the first time an airplane has been towed with its engine shut off. The machine used in this case was a Wasp-engined Vought Corsair.

As a result of this demonstration, apparatus of the same type will be installed on the two new rigid airships now under construction for the Navy. The new dirigibles will be so constructed that from three to five airplanes can be taken up and stored inside the hull, to be launched whenever they are needed. This possibility is said to have great military importance in addition to offering interesting commercial uses. In the course of the recent experiments, the plane was landed, made secure, serviced refueled and launched again within a few minutes.

Type Certificates Approved

WASHINGTON (D. C.) — Approved type certificates were issued by the Department of Commerce during the week ending Aug 24 for the following planes. No. 199-Crown B-3 two-place open biplane, Kinner, 513 lb., 1,756 lb. No 200-Parks P-2, three-place open biplane 115 hp Axelson 860 lb., 2,318 lb. No 2011-Mono Aircraft Monocoach, four-place cabin monoplane, Wright J5, 1,173 lb., 3,092 lb., No 202-Golden Eagle Chief, two-place open monoplane, 90 hp LeBlond, 513 lb., 1,479 lb., No. 203 Aeromarine-Klemm AKL-26 two-place open monoplane, 60 hp LeBlond, Edo H floats, 500 lb., 1,590 lb. No 204-Aeromarine-Klemm AKL-26-A two-place open monoplane 60 hp LeBlond Edo H floats, 500 lb 1,590 lb ; No 205 Travel Air K-4,000 three-place open biplane Kinner 940 lb., 2 280 lb. No 206-Boeing 80-A, twenty-place cabin biplane, 3 Hornets, 6,918 lb., 17,500 lb. No 207 Cessna DC-6, four-place cabin monoplane, Challenger, 1,221 lb 2 988 lb ; No 208-Kreider-Reisner C-4-D three-place open biplane, Challenger 901, lb., 2,363 lb., No 209-Command-Aire 3C-3B Trainer, two-place open biplane, 105 hp Siemens-Halske, 682 lb 2022 lb.

Announce "Ace" Tire Kit

FORT WORTH (TEX.) — An airplane tire repair kit weighing 1½ lb is being manufactured by the Rubber Products Company here as an insurance against excessive delays due to tire trouble. This small kit, called the "Ace," can easily be stowed away in the cockpit. The kit includes one tube repair, one junior airplane tire patch, one special airplane tire patch and one tire pump.

Bendix to Head General Instruments

SOUTH BEND (IND) — Vincent Bendix has been named chairman of the General Instruments Corporation, a new company established by Bendix aviation interests to direct and operate three instrument companies—the James P. Marsh Company, of Chicago, the American Paulin System, Inc., of Los Angeles, and the Tiffany Manufacturing Company, of Newark N. J., it was announced at the Bendix offices here today.

Assimilation of other companies is planned to give General Instruments a most complete line of aviation, automotive, engineering and technical instruments. Walter J. Buettner, of the Bendix Brake Company, will be secretary and treasurer of the new combine.

The Marsh company manufactures a complete line of quality gages and heat control appliances; the Tiffany company contributes a line of ammeters oil pressure and other automotive gages; while the American Paulin System, Inc., manufactures precision instruments, including an altimeter for planes which it is claimed registers the height at which a plane is flying within 3 ft. General Instruments will have $2 000 000 in cash available immediately for operating requirements and its stock will be listed on the principal exchanges.

Test Campbell Super Sport

VAN NUYS (CALIF) — Powered with a new series Kinner engine the new Campbell "Super Sport" monoplane demonstrated a climb of more than 1 000 ft per min when test flown at Los Angeles Municipal Airport Aug 21. The Campbell plane is a two-place open sport monoplane with a span of 30 ft and a weight light of but 810 lb. It was designed and built by Mark Campbell builder of the original Golden Eagle monoplane. Test flights were made by R. E. Gale. Three lightplane records will be assulted by Gale flying the Campbell plane and it is hoped to set new marks for altitude endurance and air line distance. Following extensive flight tests it is planned to place this plane on the market for sport and pleasure flying.

Goodyear "Defender" Launched

AKRON (OHIO) — The Defender,' sixth and largest of the Goodyear pony blimp fleet took to the air for the first time Aug 9. The Defender has an eight-place cabin. There are six heavily upholstered arm chairs for the passengers in addition to quarters for the pilot and his assistant. The floor of the passenger cabin is of hardwood highly polished. Above the floor and extending upward to the windows is plush upholstering. The windows are designed to give the passengers full visibility. They slant outward and permit passengers to look straight down straight up or out. The ship is expected to develop a speed of between 65 and 70 m p h.

New Glider To Be Adjustable

LOS ANGELES (CALIF) — Patent application has been filed on a specially constructed glider, with adjustable wing and seat designed to accommodate pilots of various weights, according to Wycliffe A. Hill, executive secretary of the Aviation League of America.

Sign Board Readable From Both Air and Road

DETROIT (MICH) — Advertising for the air-travelling public is the latest development of Standard Oil Company (Ind.). A large bulletin board, set at a 45-deg. angle so that it may be read as easily from the air as from the highway it adjoins, has been erected near Ford Airport here. It is said to be clearly readable from a height of 700 ft, and it attracts considerable attention

from the air passengers who are constantly arriving at and leaving the airport.

This bulletin board is believed to be the first of its kind, but the company intends to erect others in various parts of the territory it serves, and it is expected that other advertisers will use the same idea. The novelty of the sign naturally attracts the attention of motorists also and a line at the bottom explains its purpose.

Lockheed Schedule Increased

DETROIT (MICH) — An increase in the working schedule of Lockheed Aircraft Company a subsidiary of the Detroit Aircraft Corporation, to a 47-hr week from a 45-hr. week will be made at once officials announced today. This change in schedule it was said, is the first step in a program now in progress for increasing production.

Test New Lear And Fleetcraft Planes

NEW YORK (N Y) — Tests of new models built by Fleetcraft Airplane Corporation, Lincoln, Neb., and Lear Aircraft Company, Pratt, Kan., have been successfully completed recently, according to reports received from the factories. The Lear is a small biplane with Velie engine designed for training and sport use which will probably be sold under $3,000. The Fleetcraft "Model A" is a side-by-side two-place biplane powered with a 60 hp. LeBlond engine, and it is also expected to sell for less than $3,000. The Fleetcraft company was incorporated recently with a capital of $1,500,000, and is preparing to build a new factory which will make possible a production schedule of 1,000 planes annually.

Aircraft Builders, Inc., Portland, Ore., is preparing to test flight the "Student Prince," a new model sport and training biplane which has been under construction for six months, and is said to incorporate several novel features. Orders for over 100 of these planes have already been received from schools using Rankin System of flying instruction. Another new training plane, a low-wing monoplane known as the "Ranger," powered with 32 hp engine and weighing 667 lb complete will soon be tested by Weeks Aircraft Company Milwaukee, Wis.

U. S. Schneider Racer Out

ANNAPOLIS (MD) — Failure to get his Mercury seaplane off the water in three attempts has caused Lieut Alford J. Williams to abandon his plan of taking it to England for the Schneider Trophy Contest. Damage to the propeller stopped the first attempt, and failure of the engine attributed to faulty gasoline feed was said to be responsible for the subsequent disappointments. Similar minor difficulties which prevented him from getting his plane ready in time kept Lieutenant Williams out of the Schneider Cup race at Venice, Italy, two years ago.

[The Mercury was described on page 344, issue of August 17 —Ed]

Prepare to Offer Cadet Plane

WICHITA (KAN.) — Wichita Airplane Manufacturing Company has been reorganized and work has started at its factory on three types of biplanes. The smallest plane the "Cadet" already has undergone rigid tests in the air. It is being built for use of sportsmen. The "Captain" will be a two-place training and sport plane and the "Major" will be the cabin craft. The Cadet and Captain will carry LeBlond engines. The new board of directors of the company includes A. O. Rorabaugh, John H. Engstrom, C. A. Noll, S. A. Gardiner, Tom Harley, Vincent Meeke and J. N. Chapple. Harley is president and Noll is vice-president of the company. Chapple is secretary.

Report 312 Airplanes Operating in Dominion

OTTAWA (ONT.)—According to latest statistics available, there are 312 aircraft operating in Canada from 47 aerodromes with 249 commercial pilots and 199 private pilots as well as 245 engineers. The Government is spending approximately $140,000 this year on matters directly pertaining to the flying clubs of the Dominion, this amount including the cost of planes which are presented to clubs under an agreement adopted in 1927 for the encouragement of flying.

Fifty two new planes, commercial and private, were registered during the month of May, the latest record obtainable, while from the beginning of the year to the end of May a total of 151 private and 46 commercial pilot licenses were issued.

While the number of planes in operation in Canada may not appear large in comparison with those of other countries, aviation is making rapid strides.

Plans are being completed for the establishment of a coast-to-coast air mail route from Halifax to Vancouver while another service which is being placed on a regular basis entails the taking of mail from the transcontinental train at Winnipeg and flying it to Banff via Regina and Calgary, where it is placed on another transcontinental train, a saving of 24 hr.

Central Offers Engine Service

WICHITA (KAN.)—Central Air Lines division of Universal has officially opened a complete plane engine service station. Both Wright and Pratt & Whitney engines will be repaired, overhauled and serviced at the Wichita station. A. L. Yeiler is in charge of the shop, with fifteen men working under him. Parts for all types of engines are carried.

Completing Curtiss Reid Plant

MONTREAL (QUE.)—Rapidly nearing completion, the new Curtiss-Reid airplane plant is to be ready for production shortly. Demand for the Curtiss-Reid "Rambler" planes necessitated the firm's expansion. The company now operates airports at Kingston, Toronto and other cities in Ontario in addition to a large airport at Cartierville on the Black River here.

Ice Warners for W.A.E.

NEW YORK (N. Y.)—Twenty four ice warning indicators have been ordered from Moto Meter Gauge & Equipment Corporation by Western Air Express. This is a step by the latter West Coast firm in preparation for winter flying.

Tarrier Steel Enters Industry

COLUMBUS (OHIO)—Tarrier Steel Company, this city, has entered the airplane hangar field in the fabrication of ornamental and special items connected with airports.

May Spot Line Trouble With Plane

MINNEAPOLIS (MINN.)—Northern States Power Company, with headquarters in this city, has under consideration a plan to use airplanes equipped with electric "ears" to spot breaks in the 8,000 mi. of power lines operated by the firm in the Northwest.

At present the company is forced to use dog teams on this work, because of the inaccessibility of many of the transmission lines. The proposition was discussed at a meeting between local officials and five officials of Byllesby Engineering and Management Corporation and Shaffer Oil and Refining Company, affiliated with Northern States. The party flew here from Chicago for the conference.

Schools and Colleges

THE OMAHA Y.M.C.A. will soon open a flying school with H. W. Peterson, traffic manager of the Boeing Air Transport in Omaha, in charge.

THE UNIVERSITY OF WICHITA is offering for the second year a four-year course in aeronautical engineering.

FRIENDS UNIVERSITY, Wichita, will offer this year a general non-technical course in aeronautics to be given by Frederick Daniel, assistant chief engineer of the Knoll Aircraft Company of Wichita.

OREGON INSTITUTE OF TECHNOLOGY, Portland Y.M.C.A. Industrial School, has added aviation courses to its curriculum.

UNIVERSITY OF CINCINNATI will inaugurate this fall a five-year co-operative course in aeronautical engineering which is said to be the first of its kind ever offered. Bradley Jones, for years a physicist and research expert at the Wright field in Dayton, will be in charge.

NATIONAL INSTITUTE OF ENGINEERING, Brooklyn, N. Y., will offer this fall a complete evening course in Practical Aviation.

Y.M.C.A. at Providence, R. I., has opened a ground school of aeronautics.

AROOSTOOK AIRLINES, INC., of Caribou, Me., recently formed to operate transport planes, has organized a flying school.

CURTISS FLYING SERVICE is expected to open a ground school at the Springfield (Mass.) Airport early in September.

CLARENCE N. COOK, President of the Cook Glider and Sailplane Company, Kansas City, Mo., has opened enrollment in glider school there.

To Build Wind Tunnel For Berliner-Joyce Firm

PHILADELPHIA (PA.)—A contract for one of the largest privately owned wind tunnels in this country has been awarded by the Berliner-Joyce Aircraft Corporation to the M. A. Long Company, of Baltimore. The contract also covers the erection of a building to house the complete aerodynamical laboratory of the Berliner-Joyce Corporation.

The wind tunnel, which is of the double return open-jet type, will embody many new features. Principal among these is a complete elimination of vanes, honeycombs, and other forms of air straighteners. The elimination of any form of air straightener will permit of an estimated air speed of 120 m.p.h. at the open jet of the tunnel. The tunnel fan will be operated by an electric motor of 250 hp. capacity. The laboratory building and tunnel were designed by the research staff of the Berliner-Joyce Corporation under the direction of William H. Miller, chief of research.

Firm Plane Called Practical

OKLAHOMA CITY (OKLA.)—Practical uses of an airplane in business are shown in the record of a Ryan Brougham in the service of Earl W. Baker & Company, a construction firm with headquarters here. During 30 days the plane covered an average of 370 mi. a day, making a total of 11,100 mi. in 96 hr. of flying at an average speed of 112 m.p.h. Nearly all of the trips made were for strictly business purposes. Engineers were transported to supervise construction projects, executives of the company used the plane to reach conferences, material was carried in answer to hurry calls, and aerial photographs of the progress of various jobs were made.

Curtiss Fliers Ordered Higher

MIAMI (FLA.)—Maj. E. H. Brainerd, vice-president of Curtiss Flying Service in charge of national operations, sent all managers of Curtiss fields and schools the following order: "You will instruct all pilots in Curtiss service to keep an altitude of 2,500 ft. when flying over densely populated city areas." This altitude in excess of law requirements will nearly eliminate noise.

(Continued from Page 181)

ant Secretary has not announced his plans but it is understood that he will accept one of various offers from commercial aviation companies. He was appointed by President Coolidge Aug. 11, 1926.

Like his present chief, Major Young is an active pilot and has made extended trips in his Stearman biplane on Department of Commerce business both in this country and recently in Europe. Mr. MacCracken holds Pilot's License No. 1 and Major Young holds License No. 2.

Air Travel Luggage Displayed in New York

NEW YORK (N. Y.)—Lightweight luggage with ingenious space-saving compartments, suitable for air travel was featured in the Annual Luggage and Leather Goods Show in the main ballroom of the Hotel Pennsylvania recently. Fitted cases were much less elaborate than usual, and some very smart luggage was shown with linen or basket-weave covering instead of the conventional, heavier leather.

Among the more interesting items exhibited by the various manufacturers was a collection of featherweight bags shown by Migrator, who specializes in hatbox and suitcase designs with hangers and compartments to keep clothes separated from each other. Oshkosh had a very small men's trunk which has space for at least four suits with space around them for other necessities. Hartmann had a special line of lightweight luggage known as "Debonair" designed particularly for air travel.

Seek Ground Crew Reduction

AKRON (OHIO)—In an effort to reduce the ground handling cost of its small dirigibles, Goodyear-Zeppelin Corporation, subsidiary of Goodyear Tire & Rubber Company, has announced that prizes will be given Goodyear employes offering the best suggestions for reducing or eliminating the present necessary ground crew. Prizes will total $300, and will be divided into $150 for first, $100 for second, and $50 for third places. It is with the object of doing away with this unsatisfactory arrangement that the contest has been announced. It will close Oct. 31.

Stanavo Board Charts Oils

NEW YORK (N. Y.)—The Standard Oil Company of California, the Standard Oil Company of Indiana, and the Standard Oil Company of N. J. have co-operated in organizing a board of chemists and engineers to refine and test oils for use in aircraft engines. Oils under the commercial name of Stanavo will be available to pilots about September 1. This Stanavo Specification Board, as it is called, has tabulated a chart of recommended oils indicating the correct grade for 46 aircraft engines manufactured in this country.

Aero Exhibit for Oil Fair

TULSA (OKLA.)—Airplane exhibits will occupy more than 40,000 sq. ft. of space which have been added to the International Petroleum Exposition & Congress plant here when the "World's Fair of the Oil Industry" is held Oct. 5-12. This action was taken as an official recognition of the important place aviation has taken in the petroleum industry. In connection with the aircraft exhibits a program is being arranged which will include maneuvers.

Name Indiana Tour Stops

INDIANAPOLIS (IND.)—Evansville, Fort Wayne, Terre Haute, and Elkhart have been designated as overnight stops on the state air tour which will begin September 16 under auspices of the Indiana Aircraft Trades Association. The tour will start from Hoosier airport and end at Capitol airport, Indianapolis.

Bellanca Completes New Long Range Plane

PHILADELPHIA (PA.)—The Bellanca factory at New Castle, Del., has turned out a plane designed to have a 10,000 mi. non-stop cruising range for the Chicago Daily News. The tanks hold 2,190 gal. of fuel. This plane has been in process for seven months and was given its first trial flight on August 20. Two Pratt & Whitney Wasps are arranged tandem in the plane's nose.

A shaft running through the fuselage carries power to a three-bladed propeller which has been installed in back of the cabin as a pusher. The other engine runs a two-blade tractor propeller in front. Weighing 6,200 lb. the plane has a carrying capacity of 14,000 lb. The wing has a span of 84 ft. 6 in. and the fuselage is 25 ft. long. By removing the large fuel tank, twelve instead of four persons may be accommodated, it is said.

To Discuss Care of Pilots

DETROIT (MICH.)—Care of mail pilots will be the subject of a paper which Dr. J. A. Tamisiea of Omaha, Neb., flight surgeon for Boeing Air Transport, will read at a national medical meeting in Detroit the last week in September. The paper will be prepared at the request of Dr. L. H. Bauer, medical director of the Aeronautics Branch of the Department of Commerce.

Announce Starters In Cleveland Derbies

CLEVELAND (OHIO)—Entrants in the Portland, Ore., to Cleveland air derby who took off on August 23 were: Charles W. "Speed" Holman, Laird; T. A. Wells, Travel Air; Tex Rankin, Waco; W. H. Emery, Travel Air; W. B. Clark, Travel Air; Maj. G. H. Eckerson, Waco; Dick Rankin, Waco Taper-Wing; Sydnor Hall, Travel Air; Clarence F. Bates, Waco.

Fifteen fliers started from Miami, Fla., to Cleveland on August 24. They were: C. D. Bouye, Lee Bowman, Earl Rowland, George F. Halsey, Robert E. Dake, Frank Courtney, C. A. Burrows, E. Newsome, A. J. Bulock, J. Carroll Cone, Charles W. Meyers, Bert Hassell, W. A. Grant, Glenn E. Messer, and W. J. McDonough.

The six starting from Oakland August 25 were: Loren W. Mendell, J. O. Donaldson, Bob Nagle, D. C. Warren, and Bob W. King. Six others were preparing to start from Los Angeles in the non-stop race to Cleveland. They were Lee Schoenhair, Harry J. Brown, John Woods, O. C. LeBoutillier, Roscoe Turner, and Art Goebel, it is reported here.

Name Aircraft Finance Board

LOS ANGELES (CALIF.)—Members of the advisory board for Aircraft Finance Corporation of America, as announced by A. O. Hunsaker, president, are as follows: Paul E. Richter, vice president of the Aero Corporation of California; George E. Moreland, president of Moreland Aircraft; Simeon W. Crahill, Jesse W. Schurkman, F. M. Bowman, William Hepner, W. B. Hart, Henry I. Lea, W. Cady Griffith, Dr. Dorington G. Little, William H. Cutler, Theodore Fisk Pierce, Carl Wrelen, Frank F. Carpenter, J. S. Craig, O. J. Rhode, and Charles F. Chapman.

Novice Flyers Making Better First Glider Hops Than Pilots

SOUTH WELLFLEET (MASS.)—Better "first hops" are frequently made at the Cape Cod Glider School by students who have never been up before than by experienced airplane pilots. The natural move for a power plane flier—as when he finds himself with a dead engine—is to push the stick forward and start downward to prevent spinning. On recalling that he is in an engineless craft, he pulls the stick back to gain altitude.

Many novices on the contrary move the stick little, if any, and consequently do not drop. He many times stays in the air slightly longer and glides a greater distance.

Elementary instruction at the Glider School is all conducted with German primary gliders of the Zoegling type and the Prüfling soaring type is used when students master the essentials that can be learned with a Zoegling. Wings of three types are awarded to students. A button with a single set of wings is awarded when a student has been up thirty seconds, one with two sets of wings when he has been up a full minute and done a right and left bank. One with three sets of wings, the most advanced rating, calls for a flight of five minutes with a Pruefling glider. Maj. Clarence Doll has offered a reward to the first to glide non-stop from South Wellfleet to Nauset Light, thence to Highland Light and from there back to the school, a distance of 15 mi., according to reports.

BRIEFLY

Bureau of Standards calibrations showed that Waldo Waterman, test pilot at the Los Angeles Metropolitan Airport, made an American altitude record for commercial planes of 20,820 ft on July 27

A new all metal mail monoplane, manufactured by the General Airplanes Corporation of Buffalo, was tested recently.

Hamilton Maxwell, Inc, aerial photographers and surveyors, have moved their New York offices to Springdale Post Office, Stamford, Conn.

The Air Corps at Wright Field, Dayton, Ohio, just completed tests on the world's largest aerial camera, known as the K 7a It takes a picture of 9x18 in. and weighs 130 lb.

Tests under the auspices of the Eastman Kodak Company, were made on aerial colored movies

The majority of the stock of Sikorsky Aviation Corporation has been deposited under terms offered by the United Aircraft and Transport Corporation for the acquisition of the former company

The second annual Marion air exposition will be held at Marion, Ind, Sept. 23

A Cessna monoplane, powered by a Challenger, recently was flown to an altitude of 14,600 ft in less than 2 hr with a net load of 1,282 lb.

Comdr Donald B MacMillan plans to survey thousands of miles of unseen land and sea at Labrador and Baffin Land by plane during his 1930 survey.

The Department of Agriculture announced that the Forest Service hopes to install, within the next two or three years, seaplanes for use in patroling the two national forests in Alaska

The Miami Aircraft Corporation sold its first cantilever amphibion plane to Col E H R Green of Star Island, Fla, for $18,000

The American LaFrance and Foamite Corporation has removed its Utica office and plant to the company's general offices and factory at Elmira, N Y

Skyways, Inc, has transferred its headquarters from 45 Newbury Street, Boston, to its new hangar at the East Boston Airport.

Construction of the first Armstrong Seadrome will get under way next month

The Ludington Philadelphia Flying Service has removed the New Bedford stop of the Cape Cod Airway, and substituted Fisher's Island, N Y, for the convenience of New York passengers Another landing is now made at Valley Stream, L. I. A change in time now has the return service leaving Wood's Hole Mass, at 7 a.m Monday mornings, instead of 6 a m

Lieut Robert S Fogg, one of the best known pilots in New England, is winding up his seventh season at The Weirs N H, where he recently logged his six thousandth hour in the air. He has a record of flying more than 15,000 passengers without an accident

Lieut Harry Halverson, co-pilot on the refueling flight of the "Question Mark," has been decorated with the Distinguished Flying Cross, by Brig-Gen Benjamin D Foulois at a ceremony held at Wright Field

A new aircooled "Vee" type airplane motor rated at 125 hp is to be brought out within two months by the Tank Aero Corporation of Milwaukee, Wis, according to an announcement by A J. Tank, vice president and general manager.

An air meet was held on Aug 23 24, 25 under the auspices of the White Mountain Air Service at Whitefield N H, with Army, Navy, National Guard and commercial pilots participating

The Jawhawk Aircraft Corporation is being organized in Wichita, Kan, to build a plane designed by Thomas M Finme W D Egolf, Wichita oil operator, is handling preliminary details of organization.

Mid-continent Air-Express a subsidiary of Western Air Express, recently secured a lease for use of the New Municipal Airport at Wichita, according to Alfred MacDonald, Director of Parks and Airports

Standard Steel Propellers are used as regular equipment by T.A.T, N.A.T, Pacific Air Transport and Western Air Express, in addition to many mail and commercial lines.

The Boeing Airplane Company is now employing 1,475 men, the largest payroll in its history, in connection with production work on the Army order for 90 P 12 high speed fighting planes

Commercial production of the Challenger-powered biplane of the Braley Aircraft company of Wichita, Kan, will start within 30 days, if an approved type certificate is secured by that time

The Ontario Air Service established a new record of 7,792 hr this year to date which compares favorably with 5,100 hr for the entire year of 1928

The Federal Government of Canada is employing aircraft of the Laurential Air Express Company to deplete by bombing the huge school of porpoises in the Gulf of St Lawrence

A new winged sea sled, designed to cross the Atlantic Ocean at a speed of 75 m.p.h, and capable of carrying 30 persons with baggage, is being built at a shipyard in Quincy, Mass by the owner, Paul K Dudley. Above the sled 40½ ft. long with a beam of 9 ft is a single wing, with a spread of 42 ft., designed to keep the craft skimming along the water Three engines will furnish 365 hp

Aerotus Products Corp has moved to enlarged manufacturing and office space at 7012 South McKinley Avenue Los Angeles

The first air meet at Brainard Field since its opening in 1921 was held Aug 23 under the auspices of the Hartford Aero Club

New Firms Announced

Northern Airlines, Inc., North Adams, Mass., capital $100,000, by William A O'Hearn, Philip A Lee and Carl A. Weber

Olesen Aircraft Company, Bridgeport, Conn., by Svend Olesen

Burgess Aeronautical & Engineering Corporation, Santa Monica, Calif, capital $3,000,000, by Lieut Walter A Burgess, C. P Unicker, George B Bush Harley A. Harmon, Joseph C Wheeler, Charles F Fries John D Rishell, C W Van Dyke, A L Cheney, Maj Thomas Walkup and James Burgess

Davenport Airways, Inc, Davenport, Iowa, capital $100,000, succeeding Iowa-Illinois Airways company as lessees of Cram Field.

Airport Engineering & Construction Company, capital $10,000, by A P Barrett, Tom Hardin, Silliman Evans, C R Smith, and Raymond E Buck

Nebraska Sailplane Aviation School, Omaha, Neb., capital $15 000 1,200 shares, by Harold M Gregory, Alice M Gregory, George C Pardee

Silver Fox Airlines, Inc., Muncie, Ind. capital 1,000 shares common and 1,000 shares preferred, each $100 par value, by Reese Jackson, Guy Noel, Earl Tomlinson and Fred Werts Muncie, and James Werts, Yorktown

New England Marine Sales, Inc, Boston, Mass., capital $60,000, by J. Ernest Kerr, George W. Brooker, Boston, and C Harold Baldwin, Brookline.

Plymouth Airways, Inc, Plymouth, N. H., by Norman Smith and Barton McClellan

Erie City Airport, capital $100 000, by J. F. Bower, J B Parent and G B Harris

Aviation Corporation of Canada, Ltd, capital 200,000 shares class "A" and 200,000 shares class "B," and 7 class "C" shares

Wing Aeronautical Corporation, New York, N. Y. (Delaware incorporation), capital $1 000 with 100,000 $10 par value shares authorized, by John J Dobson, Brooklyn, N Y, William C Bushell, New York, and Alfred Schwarz, Montclair N. J.

Dieselair Motor Company, Dayton, Ohio, capital 250 shares, by William M Matthews and others

Airport Lighting, Inc, Delaware capital 100,000 no par value shares, by Frank G Diffin, Lieut John S Donaldson, Harold H Emmons, Commodore F G. Ericson, and Edward Froede

Montreal Airdrome, Ltd. Montreal Canada capital $200 000

Sanders Air Service, Inc., Los Angeles, Calif, capital 7,500 shares of no par value stock, by Floyd S Sanders, Norton S Sanders and E James Osborne.

PERSONNEL

Maj C. E Fauntleroy has been elected president of the Federal Aviation Corporation, of New York City, to succeed the late Col John A Hambleton He was test pilot for the American Air Service in France during the war, and later colonel in charge of Polish aviation, which he helped organize Major Fauntleroy commanded the Kosciuszko Squadron made up of volunteer American pilots

Mark L. Felber, formerly of the Firestone Tire & Rubber Company and publisher of the East Akron *Herald*, has joined the aeronautical branch of the publicity department of the Goodyear Tire & Rubber Company

Mr. Francis H Love, known in export circles in New York, Europe, the Orient and South America, has been elected President of United Aircraft Exports Inc, a division of the United Aircraft & Transport Corporation

George T. McCollough formerly traffic manager for the J. A Snyder Transportation Company, of Joplin, Mo, has been made assistant to George Sawallesh in the traffic department of Central Air Lines at Wichita, Kan

Theodore Moffitt, formerly in charge of the ground school division of the Wichita Flying School, has become a pilot with Western Air Express

G W. Moe has been appointed field manager for S A F E at Lambert-St Louis Field to succeed R. H. Allen, who has been transferred to Fairfax Field, the Kansas City airport of S A F E.

Harvey J Stoneburner has resigned as engineer in the Aeronautics Branch to become chief engineer for the American Eagle Aircraft Corporation of Kansas City, Kan He succeeds Jack E Foster.

Earl J Smith, formerly vice-president of the American City Bureau, Chicago and New York and a well-known authority in the Chamber of Commerce field has been appointed assistant to the president and chairman of the Public Relations Division of the Stinson Aircraft Corporation, Detroit.

C L Tipton manager of the travel department of the City National Bank and Trust Company, Dayton, Ohio, has been appointed representative in that territory of the Transcontinental Air Transport, Inc

Mrs Jean R. Whitman has the distinction of being the first aeronautical hostess in Indianapolis where she is employed by Curtiss Flying Service at Stout Airport

J. L Thompson, Army reserve pilot, has been added to the staff as an instructor in the Collier School of Aeronautics at Tulsa Okla

William Estabrook, former manager of the airport at Brockton, Mass. has been appointed traffic manager of the Dennison airport, at Quincy, Mass, where he will also handle the ground and motor schools, and give lectures to students

Guy A Ham, formerly special pilot and sales representative of the Porterfield Flying School, Kansas City, Mo. has joined Walter S Rogers & Associates of Boston, Mass, distributors of Davis Aircraft for New England

Stein Lee, a graduate of Texas Air Transport Flying School, Inc., of Fort Worth, Tex., has been assigned to the aircraft sales division of Southern Air Transport Inc, at San Antonio

J M Gaston has been appointed regular pilot for Interstate Airways, Inc. Hartford Conn

James Malone, formerly with the Wood River Flying School, has been appointed sales representative for the Von Hoffmann Aircraft Company, it is reported

"Boots" Dempsey has been appointed test pilot for the Curtiss-Robertson Airplane Manufacturing Company

Roger F Becker engine expert, has been named chief instructor of the Curtiss ground school at St Louis.

John L Hill, vice-president and general manager of the Spartan Aircraft Company of Tulsa, Okla, has resigned

H C Sine, recently of the inspection section of the Aeronautics Branch, has been selected as chief inspector for the Spartan Aircraft Company, Tulsa Okla

AERONAUTICAL CALENDAR

Aug. 23-Sept. 9	Second National Aircraft Show Toronto, Canada
Aug 24-Sept 2	National Air Races and Aeronautical Show Cleveland Ohio.
Sept. 2-7	Class C Aviation Exhibit Rochester Exposition at Rochester N Y
Sept. 6-7	Schneider Cup Race over the Solent Cowes, England
Sept. 9-14	Nebraska Air Tour auspices Omaha Chamber of Commerce
Sept 16 18	First National Air Traffic Conference, Muehlbach Hotel Kansas City, Mo
Sept 23 28	Fourth Annual New England Aviation Exposition Boston Garden Boston, Mass
Sept 28	Gordon Bennett Balloon Trophy Race St. Louis Mo
Oct. 5-21	National Air Tour Starting from Ford Airport, Dearborn Mich
Oct 12-27	Southwestern Aircraft Exposition State Fair Grounds Dallas Tex
Oct. 24-25	Conference on Municipal Airports at Washington, D C under auspices of the American Road Builders Association
Nov 18	Lehigh Airport Design Competition Closes. Lehigh Portland Cement Company
1930 February	National Air Show auspices Aeronautical Chamber of Commerce St. Louis
Feb 5-12	New York Aviation Show auspices Aviators Post, American Legion
April 5-13	All-American Aircraft Show Detroit
May 3-10	New York Aircraft Salon, auspices Metropolitan New York Division Distributor-Dealers Section Aeronautical Chamber of Commerce at Madison Square Garden New York City

TRADE TIPS

It has been reported that

Braniff Airlines, Inc, 2004 W 16th Street, Oklahoma City, Okla., is soon to begin erection of 135x141 ft hangar at the Municipal Airport, Tulsa, Okla to cost about $100,000

Todd Sanders, clerk of Lawton Okla, is taking bids for construction of 80x125 ft hangar to cost about $175,000

The city of Muskogee, Okla., will soon take bids on construction of improvements at the Hatbox Flying Field to cost about $195,000

Clearwater, Fla., is completing plans for a combination land and sea airport on Clearwater Bay

Sedalia, Mo, is making plans for a $100,000 municipal airport

Plymouth Airways Inc., Plymouth, N. H, request trade literature pertaining to hangars, airport equipment, and general aircraft supplies

Coos Bay (Ore) cities are studying sites for an airport Marshfield, North Bend, Eastside and Empire, cities grouped about the bay, plan to sponsor a joint airport

The city of Newark, Ohio, will vote on a $100,000 bond issue at the November election for the erection of an airport

Representatives Named

Arrow—Parker B. Abbott, San Francisco, Calif, Beltz Bros, Bazine Kan, for western Kansas, Frank Vrooman, Kansas City, Mo.; Joe Lewis, Santa Monica, Calif., western sales manager and factory representative

Monarch—William G. Cram, Milwaukee for Wisconsin and upper Michigan

Swallow—Washington Aeronautical Corporation, Tacoma, for state of Washington Ben Torrey, Corning, for northern California: Speed Johnson Flying School, San Mateo, for central California

Davis—Walter S. Rogers & Associates, Boston, for New England

Aristocrat—Howard Sterne, Wilkes Barre, for northeastern Pennsylvania

Moth—Curtiss Flying Service, Inc., for Metropolitan and Southern New York and Northern New Jersey.

N.A.T. Has New Department

CHICAGO (ILL) — National Air Transport has reorganized its business promotion department, formerly called traffic department, as the commercial department Ray W. Ireland, formerly General Traffic Manager becomes General Commercial Manager A new traffic department has been created to expedite the handling of cargo on the ground under the direction of William H Philp

AIRPORTS AND AIRLINES

Two Ship-to-Shore Services in Operation

NEW YORK (N. Y.)—Two steamship lines now include ship-to-shore air mail service as part of their regular sailing operations. The French line re-established its ship-to-shore air mail service with the recent flight of a C.A.M.S. 37 amphibion from the Ile de France off Ambrose Light to the company's Pier 57 at W. 15th Street. Within the same hour, a Heinkel seaplane was catapulated from the deck of the North German Lloyd's flagship "Bremen" 150 mi. from the pier at 58th Street, Brooklyn, where it arrived 6 hr. ahead of the steamship.

The French Lines C.A.M.S. 37 powered by a Lorraine Dietrich 450 hp. engine, replaces the Lioré et Olivier biplane amphibion, with a Jupiter 480 hp. engine, which was used for the same ship-to-shore service last summer. The new plane with its greater range, will continued to be used in this service from as far as 400 mi. out at sea. This reconnaissance biplane is the same type used by the French military forces, and has a wing span of 46 ft. 8 in., an over-all length of 39 ft. 10 in., and carries a pay load of 2,233 lb. at 124 m.p.h.

The C.A.M.S. piloted by Lieut. Leon Domergue was catapulted from the sun deck of the Ile de France 35 mi. from New York harbor, and made the flight to the company's pier in 42 min., cutting 5 hr. off the time required by the ship's regular mails. Baron Gobst Von Studnitz piloted the Heinkel seaplane from the Bremen to Pier 4, Brooklyn, the 150 mi. in one hour and forty-five minutes. Both planes are to be used as part of the regular ship-to-shore service by the respective companies.

Col. Charles Russell, former chief of the Free State Air Force, was instrumental in starting a ship-to-shore mail service from the North German Lloyd liner "Karlsruhe" via motor boat to Galway Harbor, Ireland, thence by motor car to Oranmore Airdrome in Galway County, and by plane over the 450 mi. to London. Using a Vickers Valiant machine, Colonel Russell flies the mails at 160 m.p.h., saving approximately 24 hrs. from the regular ship service.

Select Pasco-Portland Fields

PORTLAND (ORE.)—Location have been chosen for two emergency landing fields between this city and Pasco, Wash., and for four between Pasco and Spokane. They will be at Troutdale, The Dalles, Connell, Lind, Sprague Lake and Cheney. Five temporary or tentative sites between Portland and Pasco have also been chosen. A survey of beacon sites is being made.

Report Increase in Traffic

SAN FRANCISCO (CALIF.)—A recent report issued by the traffic department of Standard Airlines, Inc., shows an increase of 25 per cent in the passenger traffic of that company during the month of July over that of the preceding month of June.

Announce Subjects For Airport Conference

WASHINGTON (D. C.)—The subjects to be considered at the Municipal Airport Conference here on October 24 and 25 under the auspices of the City Officials' Division of the American Road-builders' Association includes:

(1) Practices in the selection of airport sites; (2) transportation and traffic regulations adjacent to airports; (3) airport management and housing and building control; (4) European practices; (5) the design of runways, landing areas and steel surfacing; (6) airport drainage; (7) relation of airport to public parks and public attendance; and (8) airport finance. Data concerning the present operation and financing of airport is being collected to assist in the discussion at the conference.

Universal's Air-Rail Reports

NEW YORK (N. Y.)—During July, Universal Aviation Corporation planes covered 63,714 mi. on the newly established "Great Circle Line," a coast-to-coast air-rail passenger service operated in conjunction with the New York Central and Sante Fe railroads. The air line from Cleveland to Garden City, Kan., by way of Chicago and Kansas City carried 585 passengers at an average speed eastbound of 122 m.p.h. and westbound of 110 m.p.h., according to the announcement made by Paul Goldsborough, vice-president. Passenger rates on the air line have been reduced by \$10.25, bringing the total fare for a transcontinental passage down to \$223.51. The coast-to-coast trip is made in 62 hr.

New England Seeks Air-Marking

BOSTON (MASS.)—A campaign has been launched by the New England Council to have New England cities and towns air-marked in co-operation with the Guggenheim Fund for the Promotion of Aeronautics. Co-operation of individuals, manufacturers, public utility companies, railroads, service clubs, chambers of commerce and the press is being sought in all New England states. A survey of air-marked communities showed that in Connecticut 66 communities are air-marked; in Maine, 91; in Massachusetts, 142; in Rhode Island, 23; Vermont, 46; and New Hampshire, 52.

Seaboard Airways Plans Line to South

COLUMBUS (OHIO)—Port Columbus is to become the northern terminal of the midwest division of the Seaboard Airways, Inc., operating an 11-hr. passenger service between Columbus and Havana, Cuba, according to plans announced by Warren B. Ferris of this city, president of the organization. Mr. Ferris revealed that offices of the Seaboard Airways, Inc., are in close negotiation with five of the major railroads looking toward an air-rail hookup whereby Port Columbus will be the point to which the five roads would deliver each a sleeper every morning with airway passengers for Jacksonville and Miami, Fla., Havana and way points.

Under the schedule outlined, a passenger may board a Seaboard Airways plane at Port Columbus at 8:30 a.m. and land at Havana at 7:30 p.m. the same day, a distance of 1,241 mi. The route from Columbus is by way of Cincinnati, Atlanta, Jacksonville, Tampa and Key West to Havana. Shuttle air lines connect the Florida cities, Tampa and Miami. Among cities which would contact with Port Columbus by rail are Chicago, Detroit, Toledo, Cleveland and Buffalo.

Plans of the Seaboard Airways contemplate the erection of \$125,000 hangar and radio station at Port Columbus. A 5 kw. powered radio transmission station unit will be built for plane control. Richard C. Dawson, Columbus, will be in charge of designing and construction of the hangar. Mr. Ferris announces that orders have been placed with the Uppercu-Burnelli Corporation, New York for fourteen Burnelli type two-engined twenty-passenger all metal monoplanes at a cost of \$86,000 each. The first plane will be ready for delivery Nov. 15 and the contract calls for one to be delivered every three weeks thereafter until the order is completed. The planes are powered with two 750-hp. Isota-Fraschini engines, both mounted on the nose of the plane.

Mail Planes to Stop at Camden

PHILADELPHIA (PA.)—The mail planes will land at Central Airport, Camden, N. J., on and after Sept. 15, according to an announcement made by Irving Glover, Second Assistant Postmaster General. Philadelphia Airport, quite some distance outside the city's center, has been the air mail terminal since the inauguration of the line May 1, 1928, except during the winter months when Pitcairn Aviation, Inc., operators of the mail route, used their own field about 20 mi. from the city.

Plan Actual Test Of Hangar Sprinklers

MIDDLETOWN (PA.)—The value of a sprinkler system to quench fires in plane hangars, a question of longstanding in aeronautical circles, will be tested at the air depot here on September 20-21. A specially designed sprinkler is being installed. When the test is made, a heap of old wings will be soaked in oil and set on fire in the presence of officials from the Department of Commerce, fire insurance underwriters, and others. The experiment will be under the supervision of Maj. Junius H. Houghton, commanding officer at the Depot.

Despite the claims of the sprinkler company which has put up a bond to cover any damage which may result from the fire, authorities at the depot are taking no chances. Every employe will be on hand to operate, if it becomes necessary, the Foamite truck, chemical apparatus and hose carts which are part of the regular equipment at Olmstead Field. It is hoped, however, that the test will be successful serving as a step toward settling the long-standing dispute between fire insurance underwriters and plane owners and operators as to fire hazard and precautions necessary to reduce it to a reasonable minimum.

Adopt Name Of "Radio Range"

WASHINGTON (D. C.)—"Radio range" is the term now being used to designate what has formerly been called the radio beacon. This refers, of course, to the radio direction apparatus which involves sending out beams denoting the path to a certain destination.

Each Colonial Flight Get Services of 30 Men

NEW YORK (N. Y.)—In order to insure the comfort, convenience and safety of the passengers, the services of thirty men are employed in connection with every flight over Colonial Air Transport's route from this city to Boston. Only twelve of these come into actual contact with the passengers, but the work performed by the others is equally important.

Four men direct the passengers and handle tickets, two bus drivers take them to and from the airports, eight mechanics under the supervision of a field engineer check, tune up and fuel the motor after which a chief pilot and two men with signal flags give the actual order for departure. In the meantime, weather reports are being received from nine men stationed along the route. Finally, a steward takes care of the wants of the passengers during the trip, while a pilot and co-pilot fly the plane.

Continental Extends Service

LOS ANGELES (CALIF.)—Two round trips daily between this city and San Diego, Calif., with Long Beach as an intermediate stop and with train connections direct from the plane at San Diego to Agua Caliente, Mex., were inaugurated on Aug. 24 by Continental Air Express. Continental Air Express has maintained a Los Angeles-San Francisco passenger service for more than two months with a low fare of \$22 one way to San Francisco and \$40 round trip.

Braniff Will Start Air Express Service

OKLAHOMA CITY (OKLA.)—Aerial express and package service will be inaugurated on the Braniff airlines Sept. 1, Philip Shumway, traffic manager, has announced. The express service will include all cities on the Braniff system and the Southern Air Transport. The combination covering all principal southwestern points. It will also include delivery and collection service in the principal cities.

Packages will be handled on passenger planes for the first few months, after which the company will use special express-freight planes. Packages will be limited to 10 cu.ft. content and 50 lb. gross. Rates will be \$.08 per lb. per 100 mi. The cost of 10 lb. of express from this city to Tulsa would be \$.80.

In cities where delivery service is provided the parcels will be delivered within 30 min. after the plane lands and packages may be picked up to the same time preceding departure. A delivery charge will be made. All parcels must be declared as to value and none accepted over \$100. No live animals or perishable goods will be handled.

Ohio Standard Oil Plans Marking

COLUMBUS (OHIO)—The Standard Oil Company of Ohio has just placed orders for fabric signs with which to mark the roofs of its plants in 272 cities and towns in Ohio for the guidance of pilots. It is understood that the Standard of Ohio intends eventually to mark every town and village where it operates with signs having letters 45 in. tall. In larger cities such as Cleveland, Cincinnati, Columbus, Toledo and Dayton larger letters, approximately 6 to 10 ft. tall will be used.

Develop Hangar Door Motors

CAMBRIDGE (MASS.)—Small electric motor units to replace one or both wheel units of hangar doors have been developed by Allen & Drew, Inc., this city. It is claimed that one unit providing motors at top and bottom of doors will handle 1,000 sq.ft. of opening, obviating the difficulties frequently encountered in operating hangar doors by hand.

Latin-American Has Change in Schedule

GLENDALE (CALIF.)—Revision of the schedule of the Pickwick Latin-American Airways tri-weekly mail express and passenger line operating between this city, Mexico City and Guatemala City, has been announced by Thomas E. Morgan, general manager. South bound planes now leave the Grand Central Air Terminal, this city, at 7:15 a.m. on Sundays, Tuesdays and Thursdays, and North bound planes from the southern terminals arrive here at 2:30 p.m. on Mondays, Wednesdays and Fridays.

The south bound planes arrive at Nogales, Ariz., at 1:30 p.m. for the first overnight stop, and leave there at 6 a.m. on Mondays, Wednesdays and Fridays arriving at Mazatlan, Mexico, second overnight stopping place, at 3 p.m., leave there at 5:30 a.m. on Tuesdays, Thursdays and Saturdays, arriving at Mexico City, the southern terminal, at 1:30 p.m.

North bound planes leave Mexico City at 8 a.m. on Mondays, Wednesdays and Fridays, arrive at Mazatlan at 4 p.m., leave there at 6 a.m. on Tuesdays, Thursdays and Saturdays, arriving at Nogales at 3 p.m., leave that city at 8 a.m. Mondays, Wednesdays and Fridays, arriving in this city at 2:30 p.m. Nine planes are employed by Pickwick Airways in this service.

Capitol to Resume Services

INDIANAPOLIS (IND.)—The Detroit-Evansville and South Bend-Louisville routes of Capitol Airways, Inc., of Indianapolis will be placed in operation again Sept. 15, according to E. E. Jose, president. The routes were temporarily abandoned last spring because of difficulties in making connections with other planes at those points. There will be two round trips daily on each route. Fort Wayne and Anderson, Ind., will be stops on the Detroit-Evansville route and Terre Haute will be the low stop on the South Bend-Louisville flight. Satisfactory connections with Interstate Airlines at Evansville and Thompson Aeronautical Corporation at South Bend is the reason for resumption.

Des Moines Has Port Licenses

DES MOINES (IA.)—An ordinance governing use of the Municipal Airport has been adopted by the city council and became effective in July. The ordinance fixes a license fee of \$25 a month in summer and \$15 a month in winter for planes of one and two passenger capacity ranging up to \$45 summer and \$30 winter rate for planes of more than six passengers while planes stopping for a day at a time are licensed at the rate of \$10 in summer and \$7.50 in winter up to \$30 in summer and \$20 in winter for the larger types. Fixed prices for flights are posted as follows: one passenger, 10 min., \$3; two or more passengers, 10 min., \$2.50 each; and for flights of more than 20 min., \$5 per passenger.

AIRPORT CONSTRUCTION PROJECTS

Construction has been started on the new $10,000 four story passenger depot for the Los Angeles terminal of the Western Air Express, and the building will be in service by December of this year, according to announcement of the Western Air Express officials. The conveniences in the new building include a waiting room, administration offices, radio and meteorological rooms, and a tower field control office. One of the features of the new depot will be a passenger handling concourse which provides for the simultaneous loading or unloading of five large Fokker planes with passengers traveling between planes and depot by means of underground tunnels.

Davenport Airways, Inc., has just been organized to operate Cram Field, Davenport, Ia. The new organization, capitalized for $100,000 has a four year lease on the field from the City of Davenport. The Austin Company of New York and Cleveland is preparing to submit a comprehensive report, embodying a recommendation for an airport site in the County of Paterson, N. J. An 80-acre tract near Wauchula, Fla., has been leased by Clarence Carlton of Arcadia and Milto Dishong of Wauchula.

Curtiss Begins Alameda Work

A $3,000,000 development of an airport at Alameda, in San Francisco Bay adjacent to Berkeley, has been undertaken by the Curtiss Airports Corporation. It will include a seaplane base, flying field, yacht harbor and drydock. The present strip of ground is to be extended 2,000 ft. into the bay. Kenneth Franzheim, New York architect, has completed plans for the development, which will cover 600 acres. The field will be accessible to passenger, express and freight electric railway lines, with highways leading to all sides of the airport.

In keeping with the policy of the highway department of improving airports in Arkansas cities, the field at Jonesboro is to be put in better condition. The Chamber of Commerce at Cedar Rapids, Ia., has approved the proposal of a $180,000 bond issue for the purchase of a field and establishment of an airport. The Lincoln, Ill., Chamber of Commerce has formed an airport committee for the purpose of leasing a field for airport purposes, which will be maintained and operated by the Capen Aircraft Corporation.

Reports in Erie, Pa., indicate that the New York Central Lines plans an 80-acre airport there to be used as a transfer point for passengers using a contemplated rail-air service between New York and the Pacific Coast. The Port of Portland, Ore., has let bids for the construction of a group of buildings for the new airport unit at Swan Island. A $40,000 bond issue to construct a municipal airport at Bucyrus, Ohio will be voted on there at the November election. The City of Youngstown, Ohio, has increased the city budget for the improvement and development of Lansdowne Airport by $50,000 making possible improvements to assure high classification.

A contract has been signed by the Nebraska Flying Service, Inc., and International Airports, of New York, providing for the immediate development of a port at Fremont, Neb.

Boeing Starts Building

The Aero Corporation of Calif. has started construction of a new steel hangar, 100x90 ft., for Pratt & Whitney at Los Angeles. The Boeing System has begun an extensive program of hangar and building construction along its San Francisco-Chicago, at Cheyenne, Wyo., Salt Lake City, and Reno, Nev., and Oakland, Calif. Owing to the intensification of the reconditioning of the civil airport at Valbuena Flying Field, Mexico City, all civil planes are using the military field, a short distance from the port.

Following the completion of grading the new Roseburg, Ore., Municipal Airport, which started August 20, the field will be lighted for night flying. The city government of Chehalis, Wash., has made arrangements for the government to light that airport. The government will erect a five-mast poly directional radio range of the visual type at the Wayne County, Mich., Airport, where a $350,000 hangar will be constructed. Wichita's new mile-square municipal airport is now lighted by a type BBT beacon of 30,000,000 cp. The new Toronto, Ont., airport being established by Skyways, Ltd., will be the first in Canada to be equipped with flood and beacon lights for night flying. Harvey Mills of Calgary, Alta., has offered to invest $72,500 in the purchase and development of a municipal airport at North Hill.

The Clark Dredging Company of Miami, Fla., will begin construction of an airport and seaplane base at Miami Beach in September. The Municipal airport at Cocoa, Fla., will be dedicated in November, at which time the field will have adequate lighting equipment.

The Division of Airports and Aeronautics, of the Aeronautics Branch recently stated that 1,174 new airports are under proposal or construction compared to 1,485 ports which had been constructed up to July 31, 1929. Pennsylvania, with 64 airports under proposal, leads the nation in new developments, with New York and California coming next, each planning 59 more fields.

Increase Goebel Firm Capital

KANSAS CITY (MO.)—Goebel Aviation Company, Inc., has increased its capital stock from $200,000 to $300,000. Conrad H. Mann, 1008 Commerce Building, this city, is president of the firm.

Proposes to Build Two 1,000 Ft. Towers

SOUTH DARTMOUTH (MASS.)—Two steel beacon towers 1,000 ft. high will be erected here at Col. Edward H. R. Green's Round Hills Airport, at an estimated cost of $20,000 each. They will be equipped with Sperry lights of sufficient power to be seen for about 100 mi., and it is expected that ordinarily these lights will be above the cloud level. They will probably require two years to build.

The 260-acre airport is now lighted by four floodlights. A new sea and land plane hangar 100x220 ft. is under construction. The present hangar houses a Goodyear blimp which is being used for technical experiments under auspices of the Massachusetts Institute of Technology.

Airport Dedications

Carroll Airport Corporation will dedicate its field at Carroll, Ia., September 12. Pittsburgh-Butler Airport of Pittsburgh Aviation Industries Corporation will be dedicated September 27-28. Other airports to be dedicated within the next few weeks are those at Evansville, Ind.; Bloomington, Ill., and Phillipsburg, Pa. Green Bay-De Pere airport will be dedicated at Allouez, Wis., and during the Nebraska air tour in September airports will be dedicated at Columbus, York, Falls City, and Kearney. The Tallahassee, Fla., municipal airport will be formally dedicated Nov. 11-12 in honor of Capt. Dale Mabry. The Beverly Hills Airport at Steubenville, Ohio, will be dedicated September 14-15.

Among airports dedicated recently were the Alexander Airport, Colorado Springs; Fairfax Airport, Kansas City, Mo.; and municipal airports at Las Animas, Colo., Sweetwater, Tex., Burlington, Iowa, Winona, Minn., Fostoria, Ohio, and Summerville, Ga.

Planes in Pollenization Tests

PRINEVILLE (ORE.)—Use of airplanes in the pollenization of seed alfalfa fields was considered probable as the result of experiments conducted on the field owned by Guy Larkin in the Ochoco tract. Pollenization was increased 30 per cent by the effect of a plane flown over the field with the wheels barely skimming the tops of the plants, and further experiments with a sandblast operated from an airplane are expected to produce even better results.

Saunders Will Rent Planes

VAN NUYS (CALIF.)—Fly-It-Yourself service has been inaugurated at the Los Angeles Metropolitan Airport by Saunders Fly-It-Yourself company. This service includes both planes and autos for rent. In addition to renting planes and autos to government licensed pilots, Saunders company will maintain a complete servicing department including facilities for relicensing and all classes of mechanical work.

FOREIGN ACTIVITIES

Australia Reports Progress in Air Mail

SYDNEY (AUSTRALIA)—The inception of the new east-west route between the capital cities of Perth and Adelaide, a distance of 1,500 mi. (at a fare of less than $.06 a mile including transport at each end, as well as one night's accommodation and meals), brings the total mileage of air mail route in the Commonwealth to 5,451 mi., flown once weekly each way. De Havilland 14-passenger tri-engined Hercules planes fitted with slotted wings are used on the new service.

National Airways, a company formed by Messrs. Kingsford-Smith and Ulm, is expected to operate soon between Melbourne, Sydney, and Brisbane, with four Avro 10's, which are the British version of the Fokker, and powered with three Armstrong Siddeley 230 hp. Lynx engines. This will increase the air mail route to over 6,500 mi. and make a clean round the continent with the exception of a comparatively unimportant stretch in the extreme north.

During the first five months of this year 51 new civil machines were registered in the Commonwealth, making a total of 172, and showing an increase of 42. Only twelve of the total are of American origin and four of these are obsolete types, which indicates an unexploited market with big future possibilities. At present no aircraft which does not carry a certificate of airworth iness from a member of the International Convention can be cleared through the Customs.

The first all-metal plane wholly designed and built in Australia has been completed and flown. It is a five place cabin type, semi-cantilever high wing monoplane, and powered with a Puma engine, having a range of 7½ hr. The steel fuselage has no welded joints, an interesting feature being its construction in three distinct portions—front end cabin, and rear end, which are easily detachable for transport purposes. The undercarriage is of split type with a track of 13 ft. It is stated that tests have proved very satisfactory. The same company is also building a tri-engined all-metal plane.

A. V. Roe With Saunders Firm

LONDON (ENGLAND)—Saunders Roe, Ltd., is the name of a new firm bearing the names of two of the best known designers in the British Empire, Sir Alliott Verdon Roe, one of England's most outstanding figures in aviation from the earliest days, has become associated with the F. E. Saunders, Ltd. This concern designed the Cutty Sark, small flying boat.

Test R-100 Engines

HOWDEN (ENGLAND)—The six Rolls Royce Condor engines of 650 hp. each installed on the British R 100 have been given their first run in the airship shed here. The inflation of the airship is practically complete and it is expected that following shed tests and inspection now under way, the actual flight tests scheduled for next month will be carried out. The ship is being built by the Airship Guarantee Company under the supervision of Comdr. Charles L. Barney, noted English airship expert.

Germans Planning Orient Airship Line

BERLIN (GERMANY)—The successful flight of the Graf Zeppelin from this country to Tokio has renewed interest in a regular Germany-Japan airship project. Such a service has been in the minds of German air leaders for some time. Right now reports include the statement that about $20,000,000 will be used to launch the project and that the airway route to be flown will include Leningrad, Krasnoyarsk, Harbin in China and probably Osaka, Japan. The Japanese terminal will be located some where between Yokahoma and Kobe or at the naval airport at Kasumigaura.

It is understood that the Hamburg-American line, already actively interested in the flight of the Graf Zeppelin, will be at least one of the heaviest backers of the proposed construction of the newer and larger dirigible now being planned. The increased interest in the airship transportation possibilities follows the recent successful flights of the Graf Zeppelin.

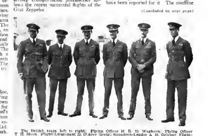
Uncertainty Surrounds Schneider Trophy Event

LONDON (ENGLAND)—The forthcoming Schneider Trophy race week—Sept. 6-7—has changed considerably in many of its aspects in recent days. While the R.A.F. High Speed flight is putting the finishing touches to a long and carefully handled period of training for the big event, word has been coming of the probable withdrawal of one after another of the teams against which it was to compete. France was the first to withdraw, then Italy announced doubt of its ability to be ready in time and asked for a postponement, and then the American entry practically was ruled out by the failure of preliminary test flights of the plane.

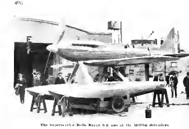
The latest word, as this is being written, is that Italy may participate after all in spite of the refusal of the Royal Aero Club, under the rules, to postpone the event. It is understood the Italian teams are being held in readiness to leave at short notice. The Italian request for a postponement followed the fatal crash of Capt. Giuseppe Motta during a test flight. The French have withdrawn definitely, as previously announced, and the American entry—Lieut. Alford J. Williams' Mercury—is considered unlikely to be brought to this side. A final test flight in Baltimore may change this.

In the meantime the British entries are being tuned for the race. The Supermarine S 6 has given an excellent account of itself in practice flights. Various speed in excess of 330 m.p.h. have been reported for it. The machine

(Concluded on next page)



The British team, left to right: Flying Officer H. R. D. Waghorn, Flying Officer T. H. Moon, Flight-Lieutenant D. D'Arcy Greig, Squadron-Leader A. H. Orlebar, Flight-Lieutenant Stainforth, and Flying Officer R. L. R. Atcherley



The Supercharged Rolls Royce S-6 one of the British defenders

(Continued from page 495)

is powered by Rolls Royce "R" engine fitted with a new type supercharger. It has twelve cylinders in 60 deg. Vee arrangement, developing much more than the 850 hp. of the Rolls Royce "H," from which it is developed.

The oil tank is in the fin, the oil circulating from the engines through coolers in the shape of ribs on the sides of the fuselage to the fin and back to the engine through ducts on the bottom of the fuselage. Unlike its predecessor the S-5, the machine has metal wings and built into the wings, of course, are the radiators. The fuselage, too, is of metal and the metal skin is designed to take most of the stresses.

Rumors are prevalent here to the effect that at least two of the Italian entries are powered with two engines of 1,000 hp. each in tandem arrangement. The preparations of the Italian entries have been surrounded with such secrecy that little is known of their equipment. It is known that the Fiat, Savoia and Macchi concerns have built racing planes and the Fiat and Isotta-Fraschini firms have built racing engines said to develop between 1,000 and 1,600 hp.

Prepare India Mail Fields

RANGOON (BURMA)—Arrangements for a landing field here and at Moulmein, Tavoy, Victoria Point and one or two other points are being made in anticipation of the extension of the Indian air mail to Singapore. The local field is expected to be ready about March. Emergency landing fields are being arranged for also between Calcutta and this city.

French Air Cargoes Valuable

PARIS (FRANCE)—Merchandise valued at about $24,000,000 was imported into and exported from France by air through Le Bourget Airport near here, according to a report made by the Assistant Trade Commissioner H. C. Schuette, of the United States Department of Commerce.

American Opens Air Line in Mexico

MEXICO CITY (MEXICO)—Mexico's network of airways was further extended last week with the inauguration of a mail and passenger service between here and Ciudad Juarez on the United States border. The line was put into service when Theodore T. Hull, American concessionaire of the route, took off in a Lockheed Vega from Valbuena Flying Field here. The plane carried 61 lb. of mail. The inauguration was witnessed by high Mexican government officials.

The scheduled flying time for the 1,009 mi. journey is 11 hr. 5 min. For the first month or two, service on the line will be twice weekly, planes leaving Mexico City Tuesdays and Saturdays and Ciudad Juarez Mondays and Thursdays. Stops are made at Zacatecas City, Torreon, Jimenez and Chihuahua City. When the volume of traffic increases it is proposed to operate a daily service in both directions. A branch line to this service between Chihuahua City and Nogales, Sonora, a distance of 348 mi., was also inaugurated last week. A twice weekly service is also given on this line on Sundays and Wednesdays from Nogales and Mondays and Thursdays from Chihuahua City.

French Line in S. A. Extended

BUENOS AIRES (ARGENTINA)—The weekly France-to-Buenos Aires boat-air mail service has been extended by the Latecoere Lines to Santiago, Chile. This is a regular service to span the Andes Mountains and will employ eight French planes. The company has acquired additional landing fields at Colina, Chile, and at Medoza, Villa Mercedes, Rufino and Pacheco in Argentina, affording them landing fields at approximately 100-mi. intervals. The nearest pass to Santiago over the Andes is Uspallata Pass, 100 mi. northeast of the city, at an altitude of 12,464 ft.

Foreign News Briefs

The Mexican Aviation Company, subsidiary of the Aviation Corporation of the Americas, is establishing a chain of radio stations along its routes in Mexico. Stations have been established at Tampico and at Brownsville, Texas, and others will be established at Vera Cruz, Merida and Tapachula. The central station will be at the Valbuena Field, Mexico City.

It is proposed to make an aerial survey of a huge jungle area on the borders of Paraguay and Bolivia which the two countries have been claiming for a good many years.

The Department of Commerce reports ideal flying conditions prevail in Argentina. There are about twenty equipped airports in the country, according to latest reports.

A new airplane factory is being built near the Valbuena Field, Mexico City.

The Societe Aerienne Bordelaise has been acquired by the Dyle Et Bacalan. Both are French firms manufacturing aircraft.

Doctor Rumpler, a veteran German aircraft designer, has announced his intention to start construction soon on a giant flying boat which he asserts will be larger than the recently completed Dornier Do X.

It is reported that the Dornier Do X will be flown to the Schneider Trophy Contest at Cowes, England, next month.

Another step in preparation for its proposed Europe-South America air service was taken by the Luft Hansa recently in a test flight of a Rohrbach Rostra to Stockholm and back. Another test flight is to be undertaken to Iceland.

Mexico will celebrate Aviation Week November 12 to 19 under auspices of the Mexican Aviation Association.

According to reports the Japanese are contemplating establishment of a military base at Mukden, Manchuria, which is to comprise 57 bombing planes.

German Luft Hansa is putting special freight liners on the Amsterdam-Muhlheim route to transport flowers. Two planes, a Junkers and a Fokker, will be simultaneously in service, of which one is for passengers only.

During their ten weeks' tour through the Dutch East Indies the King and Queen of Siam visited a Dutch airdrome and flew in a Fokker plane.

The Italian government granted a subsidy of $2,100,000 to cover a period of ten years for a new air service between Marseilles, France, and Trieste, Italy, via Genoa, Milan and Venice.

The Yellow Bird has been making a tour of European capitals.

A new airport is to be erected at Trieste, Italy, at an estimated expenditure of $89,000.

The municipalities of the Hague and Rotterdam are considering joint erection of a new airport at a site between these cities to replace the Waalhaven airport near Rotterdam.

WHAT OUR *Readers Say*

Landing Speeds Again

TO THE EDITOR:

In *Aviation* dated July 20th, page 192, Analysis of Airplane Landing Speeds, by Mr. Elliott G. Reid, the point brought out is that the landing speed as advertised by airplane manufacturers seems to be lower than the one calculated based on wing loading and largest lift coefficient. While I agree that the theoretical assumptions of Mr. Reid are absolutely correct, I want to point out that one fact has been forgotten to be taken into consideration.

In large commercial airplanes the gasoline load makes up for a considerable amount of the payload. In our F-10-A model airplane we carry, for instance, 360 gallons of fuel which is 2,160 lb. or 16½ per cent of the gross weight of 13,100 lb. The commercial airplane should be operated so that it carries at all times a load as light as possible. That means there should never be taken more gas than necessary for safe flying. Of course, considering the possibility of headwinds or detours on account of bad weather the plane will then land with a gas load equivalent to ½ or ¾ of an hour flying at cruising speed. As our Wasp engines use approximately 18 gal. per hour this would require on a tri-motor ship around 60 gal. reserve fuel of the 360 gal. the ship had at the take-off and 300 gal. would be used up. At landing the weight of the ship would be reduced by 1,800 lb. which means a decrease of wing loading by about 2 lb.

On larger ships as for instance the F-XII 4-engined 30 passenger ship we are building now, effect of the fuel load on landing speed is still higher. If this ship is used for night flying with 16 fully equipped berths it will carry fuel load of 760 gallons at take-off. Considering 100 gallons to be left in the tank at landing, the difference between the fuel load at take-off and the landing would be 3,900 lb. which again means a reduction of the wing loading by more than 3 lb. per sq. ft.

For the case of emergency landing, which eventuality is rather remote on multi-engined ships, we are equipping all our tanks with rip panels which enables the pilot to drop all or part of the fuel if so desired. This means that in an emergency landing the wing loading could also be decreased at the will of the pilot.

Another point not taken into consideration in Mr. Reid's paper is the fact that he considers the ship being in level flight at landing, whereas the ship is actually descending and the load to be lifted by the wing is not the gross weight of the ship but the gross weight minus a weight depending on the rate of descent.

I would appreciate getting your reactions on the above outlined comments.

A. A. GASSNER
Chief Engineer
Fokker Aircraft Corp. of America

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Mr. Reid Replies

TO THE EDITOR:

Mr. Gassner's criticisms are summarized below in a form which is convenient for reference.

1. Large commercial airplanes do not land with full fuel load. *Hence*: Usual landing speeds at the end of a run will be lower than those for the fully loaded condition.

2. Fuel load can be jettisoned in case of emergency. *Hence*: Landing speed will be lowered in consequence of reduced wing loading.

3. In landing, an airplane is descending and the load supported by the wings is therefore less than the gross weight of the airplane. *Hence*: Actual landing speed will be smaller than that calculated on the basis of level flight.

The conclusions as summarized under 1 and 2 are undoubtedly correct; the reduction of the gross weight of an airplane is certainly accompanied by corresponding reduction in landing speed. They are, however, entirely irrelevant, as it was clearly stated in the article "An Analysis of Airplane Landing Speeds" that the figures used therein were taken from the table headed "Performance *with Full Load* at Sea Level as Supplied by Manufacturers." It is as much beside the point to determine the landing speed of an F-10 by taking into account the reduction of fuel load as it would be to point out that when a Western Air Express pilot lands one of these machines at Salt Lake City (altitude 4,600 ft.) the effect of the reduction of fuel load is more than neutralized by the effect of reduction of air density.

The third conclusion is untenable since if steady descent be assumed it contradicts Newton's first law of motion. With zero thrust the lift in a steady glide is equal to the weight of the airplane times the cosine of the angle of glide and the rate of descent has no influence. A reduction of lift equal to 1.52 per cent of the gross weight corresponds to gliding into the ground at an angle of 10°—a maneuver which I am sure Mr. Gassner will admit is unwise.

E. G. REID
Stanford University

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Stunting and Circus Flying

TO THE EDITOR:

If aviation is to become a means of transportation and is to be taken out of the realm of the spectacular so that the business men of the country will have an appreciation of its possibilities and an acceptance of it as a means of safe and quick transportation, it seems to me that all manufacturers who are honestly interested in the furtherance of aviation will be very much against any stunting and circus flying at future aeronautical expositions.

Although we are often asked to take part in acrobatic demonstrations and races and meets, we turn these offers down because we do not believe them to be for the best interests of aviation. We will not enter competition of this kind, and if it is necessary to continue with the airplane business to keep in step with programs of this nature, I am looking forward to the day when I can resign from airplane activities. The writer believes that the airplane circus days are over, and these competitive races should be put on with the thought in mind that we are selling aeronautics to the general public who must be sold on the safety of aircraft and not to a few who want nothing but speed.

If you agree with the position we have taken, we know that you can, through your good magazine, help foster the cause of sanity and safety in aviation and we will be very grateful to you for anything you can do to promote this cause.

A few weeks ago hundreds of thousands of people watched the endurance planes breaking the world's record at St. Louis. By far the majority of them were interested from a standpoint of this demonstration of safety, but in a great measure considerable effectiveness was lost because of numerous planes stunting and doing acrobatics in an endeavor to amuse the crowds when in reality the crowd was interested and amused in seeing and being convinced that an airplane could stay aloft this great length of time without adjustments of any kind. Your comments on this situation would be interesting.

Very truly yours,

WALTER H. BEECH,
President
Travel Air Company

THE BUYER'S LOG BOOK

American Transport Goggles

FOLLOWING a long period of development the American Optical Company, South Bridge, Mass is offering the American Transport Goggle to meet the needs of airplane pilots This type of goggle was designed primarily for the United States Army The ventilating system and the lens design as well as other features, are the result of more than two years of experimentation

Two separate rubber cushions, which can be removed and replaced, and which fit closely to the contour of the face but do not interfere with nose breathing, are provided. The distance between lenses is finally and permanently adjusted without tools with a ratchet locking device. All parts are replaceable and interchangeable because the goggle is built to micrometric specifications

On the down curve of each eye cup is located a tube which catches the slipstream As the air passes through this tube it creates a suction behind the lense and ventilating air is drawn up through intake valves at the bottom of the eye cup The constant ventilation behind the lense is provided to prevent fogging. Openings are staggered so that no direct air "shots" or "needles" reach the face regardless of the speed of the plane or the velocity of the slipstream

Lense computations were made by Dr E D Tillyer, chief of the scientific staff of the American Optical Company The lenses are said to be free from aberration or distortion and decentered so that the optical center

The American Transport goggle showing ratchet locking device for nose piece

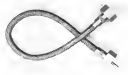
is moved to a position in direct line with the straight ahead line of the vision. They will not cause goggle headache and provides for complete eye comfort The lense can be supplied in white glass or in calobar glass and is patented Calobar glass is a glare reducing variety which does not alter color values.

Aviation Trophies

AVIATION trophies and prizes of all types are now being offered by the Aero Specialty Company, 1168 So. Hill Street, Los Angeles, Calif. The company is in a position to furnish these trophies according to the requirements of the purchaser. Also included in this line are a number of novelties such as automobile radiator emblems These emblems are carefully reproduced models of well known airplanes

Consolidated Tachometer Shaft

ANNOUNCEMENT has been made by the Consolidated Instrument Company of America, Inc., 305 E 47th St, of a new type of tachometer drive shaft known as "All Bronze" This new shafting, a patented product of the company consists of an inner cable constructed of 17 strands of high carbon, high tensile



Photograph of the "All Bronze" tachometer drive shaft made by the Consolidated Instrument Company

strength music wire in four layers under special process The casing, a bronze interlock asbestos type section reinforced with copper braided armoring, is very light in weight. It has a natural bronze finish with no japanning or lacquer to scale off. It is also very flexible and will permit of sharp bends making installation handling easier

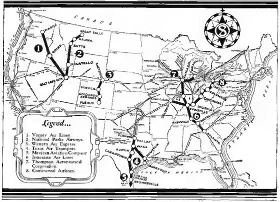
The company also is now manufacturing a full line of aircraft and engine instruments and is also in a position to furnish weather instruments for installation at airports and meteorological stations

Fafnir S Series Bearings

AS A result of an extended study of the special bearing requirements of the aeronautic industry, the Fafnir Bearing Company, New Britain, Conn., has announced a new series particularly adapted to these requirements

These bearings, known as the S Series, are of the single row radial type with inch dimensions and narrow widths They are available in bores from $\frac{1}{4}$ in to 1 in as follows

Bearing No	Bore (Inches)	Outside Diameter (Inches)	Width (Inches)
S1	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{7}{32}$
S3	$\frac{3}{8}$	$\frac{7}{8}$	$\frac{7}{32}$
S5	$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{1}{4}$
S7	$\frac{5}{8}$	$1\frac{3}{8}$	$\frac{9}{32}$
S8	$\frac{3}{4}$	$1\frac{5}{8}$	$\frac{5}{16}$
S9	$\frac{7}{8}$	$1\frac{7}{8}$	$\frac{3}{8}$
S10	1	2	$\frac{3}{8}$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POCATELLO
SALT LAKE CITY
CHEYENNE
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COLORADO SPRINGS
PUEBLO
DALLAS
WACO
AUSTIN
SAN ANTONIO
CORPUS CHRISTI
BROWNSVILLE
GULF OF MEXICO
EVANSVILLE
LOUISVILLE
CINCINNATI
NASHVILLE
ATLANTA
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OCEAN
Legend...
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3. Western Air Express
4. Texas Air Transport.
5. Mexican Aviation Company
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7. Thompson Aeronautical Corporation
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Announcing

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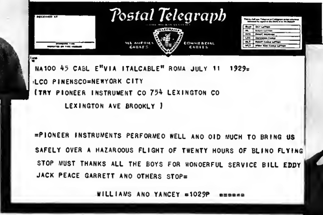

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